5700687/

LJB

engineers
architects

January 17, 2001

RECEIVED
2001 JAN 19 A 11: 34
STATE FIRE MARSHAL
BUSTR

Mr. Raymond Bauman
Bureau of Underground Storage Tank Regulations
6606 Tussing Road
P.O. Box 687
Reynoldsburg, Ohio 43068-9009

Re: Remedial Action Plan (RAP) Submittal **(Incident No. 579286-00)**
(DP&L's Transportation Center, Dryden Road, Dayton, Ohio)

Dear Mr Bauman,

As discussed during our telephone conversation last week, LJB will be providing you with an addendum to the RAP that is being submitted to you at this time for the above referenced site. The addendum will contain information that should have been included with the RAP and will support our determination that in-situ bioremediation is the best-suited approach for completing the cleanup at this property. The addendum should be completed and submitted by February 9, 2001, approximately three weeks from now.

If you, or any member of your staff, have any questions and/or need additional information regarding this RAP and LJB's current site activities, please feel free to call me anytime @ (937) 259-5043.

Thank you for your patience in this matter. Talk to you soon.

Sincerely,

LJB Engineers, Scientists & Architects, Inc.

Edward G. Galaska

Edward G. Galaska
Senior Environmental Scientist/Department Manager

3100 Research Boulevard
P.O. Box 20246
Dayton, Ohio 45420-0246
TEL: 937-259-5000
FAX: 937-259-5100

DP&L

Working For You Today And Tomorrow

Scott Arentsen
Environmental Management
(937) 331-3106 phone
(937) 331-3040 fax
Scott.Arentsen@dplinc.com

RECEIVED
2001 JAN 19 A 11: 35
STATE FIRE MARSHAL
BUSTR

January 8, 2001

Mr. Raymond Bauman
Environmental Specialist
Division of State Fire Marshal
Bureau of Underground Storage Tank Regulations
6606 Tussing Road
P.O. Box 687
Reynoldsburg, OH 43068-9009

SITE: DP&L Transportation Center
1900 Dryden Road
Dayton, OH
Montgomery County
Incident #579286-00

Dear Mr. Bauman,

In response to your November 20, 1999 letter, enclosed is a new Remedial Action Plan for the above referenced site.

If you have any questions, please call me at (937) 331-3106.

Sincerely,

Scott Arentsen

Scott Arentsen
Environmental Specialist

LJB

engineers
architects

RECEIVED

2001 JAN 19 A 11:35

STATE FIRE MARSHAL
BUSTR

BUSTR Incident No: 579286-00

REMEDIAL ACTION PLAN

DP&L Transportation Center
1900 Dryden Road
Dayton, Montgomery County, Ohio

Submitted To:

Division of State Fire Marshal
Bureau of Underground Storage Tanks
8895 East Main Street, P.O. Box 687
Reynoldsburg, Ohio 43068

Prepared For:

Dayton Power & Light
P.O. Box 8825
Dayton, Ohio 45401

January 8, 2001

Prepared By:

LJB, INC.
3100 Research Park Boulevard
P.O. Box 20246
Dayton, Ohio 45420-0246

(Project No. EN-16807.A4)

3100 Research Boulevard
P.O. Box 20246
Dayton, Ohio 45420-0246
TEL: 937-259-5000
FAX: 937-259-5100

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APPENDICES

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1.0 INTRODUCTION

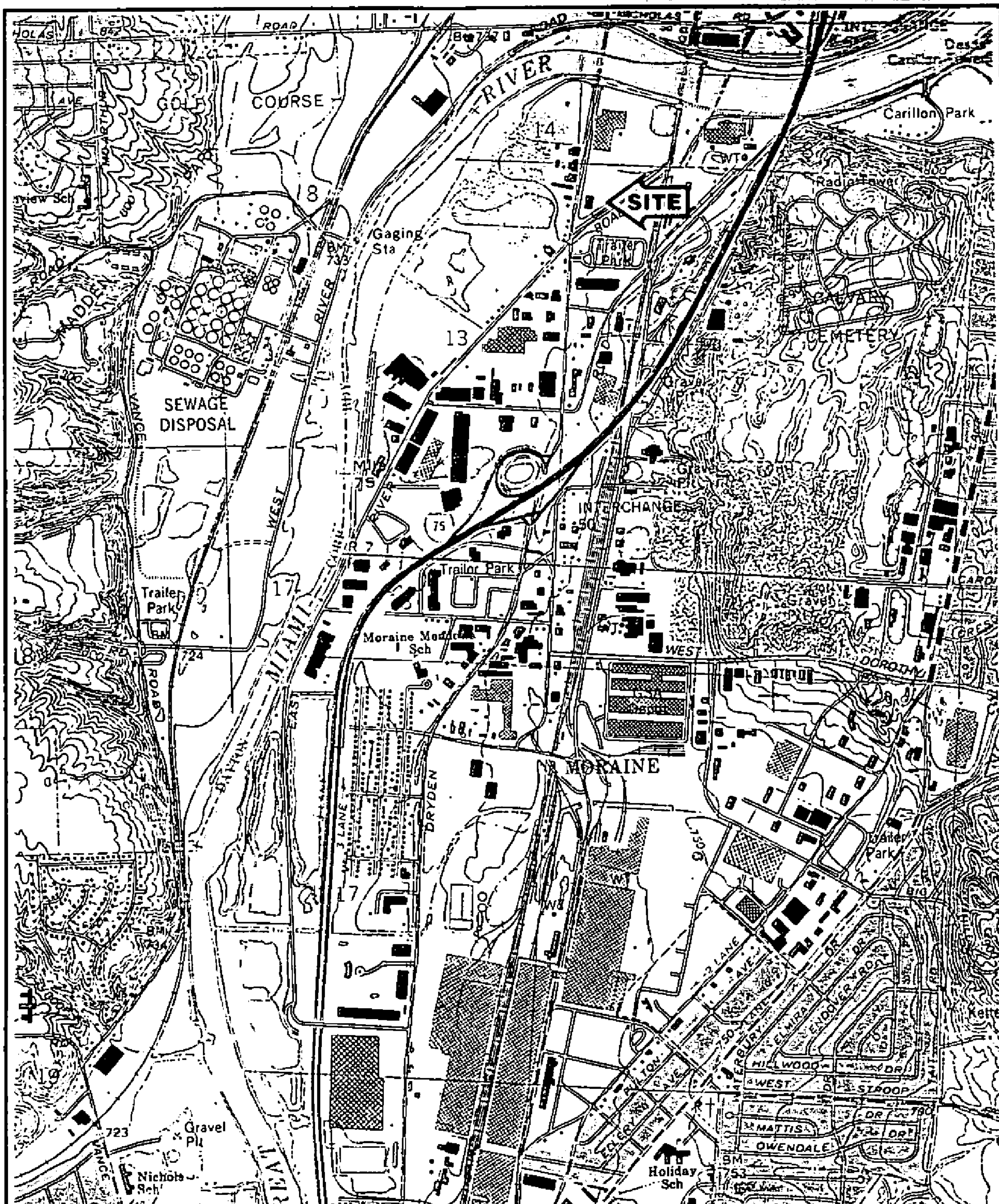
The following report describes the remedial action plan developed by LJB Engineers, Scientists & Architects, Inc. (LJB) for the DP&L Transportation Center located at 1900 Dryden Road in the City of Dayton, Montgomery County, Ohio. This remedial action plan is being submitted on behalf of The Dayton Power & Light Company in response to the written correspondence issued by The Bureau of Underground Storage Tank Regulations (BUSTR) in November 1999 (see Appendix A). BUSTR has requested that DP&L continue "active" remedial activities at the property, either by continuing with the present remedial system or by instituting a different treatment approach to achieve site closure.

1.1 Background

The DP&L Transportation Center at 1900 Dryden Road (Dayton, Ohio) is the location of a petroleum release originating from the operation of Underground Storage Tanks (USTs) and/or associated piping. This release was first documented in the "Underground Storage Tank Closure Assessment" report completed by Hunter/Keck, Inc. in July 1989. An Underground Storage Tank Closure Assessment report prepared by Hunter/Keck, Inc. detailed the removal of two, 10,000-gallon gasoline USTs in April of 1989. The USTs were located in the same tank basin, adjacent to the southwest wall of the vehicle maintenance facility (see Figure 2). Upon excavation, both tanks appeared to be in fair condition with no visual signs of leakage. During the removal of these USTs a gasoline odor was noted. In an effort to remove residual petroleum hydrocarbons, additional excavations were performed. The removal of impacted soil was continued until further excavation was not possible, and until it was believed that the majority of the impacted soil had been removed. The final excavation dimensions were approximately 35 by 50 feet and 27 feet deep. As required, BUSTR was notified and a Site Investigation was performed by Hunter/Keck to determine the extent of the petroleum contamination noted during the tank removals.

The site investigation was completed in August of 1989, which included the installation of four soil borings, three of which were converted to groundwater monitoring wells (MW-1, MW-2 and MW-3), and the sampling and analysis of subsurface soils and groundwater (see Figure 2). The results of the investigation confirmed that petroleum had impacted subsurface soils and groundwater at the site. Results of the investigation are included in Hunter/Keck's report entitled "Site Investigation at Dayton Power & Light Company Transportation Center" dated November 1989 (see Appendix C).

In May of 1990 SCS Engineers (Covington, Kentucky) (SCS) was contracted by DP&L to perform additional subsurface investigation activities at the site. These activities were conducted to further define the extent of impact to the subsurface and to support remedial design efforts. In May of 1990 three additional groundwater wells were installed by SCS at the subject property: GW-1, GW-2 and GW-3. A Corrective Action Plan (CAP) was



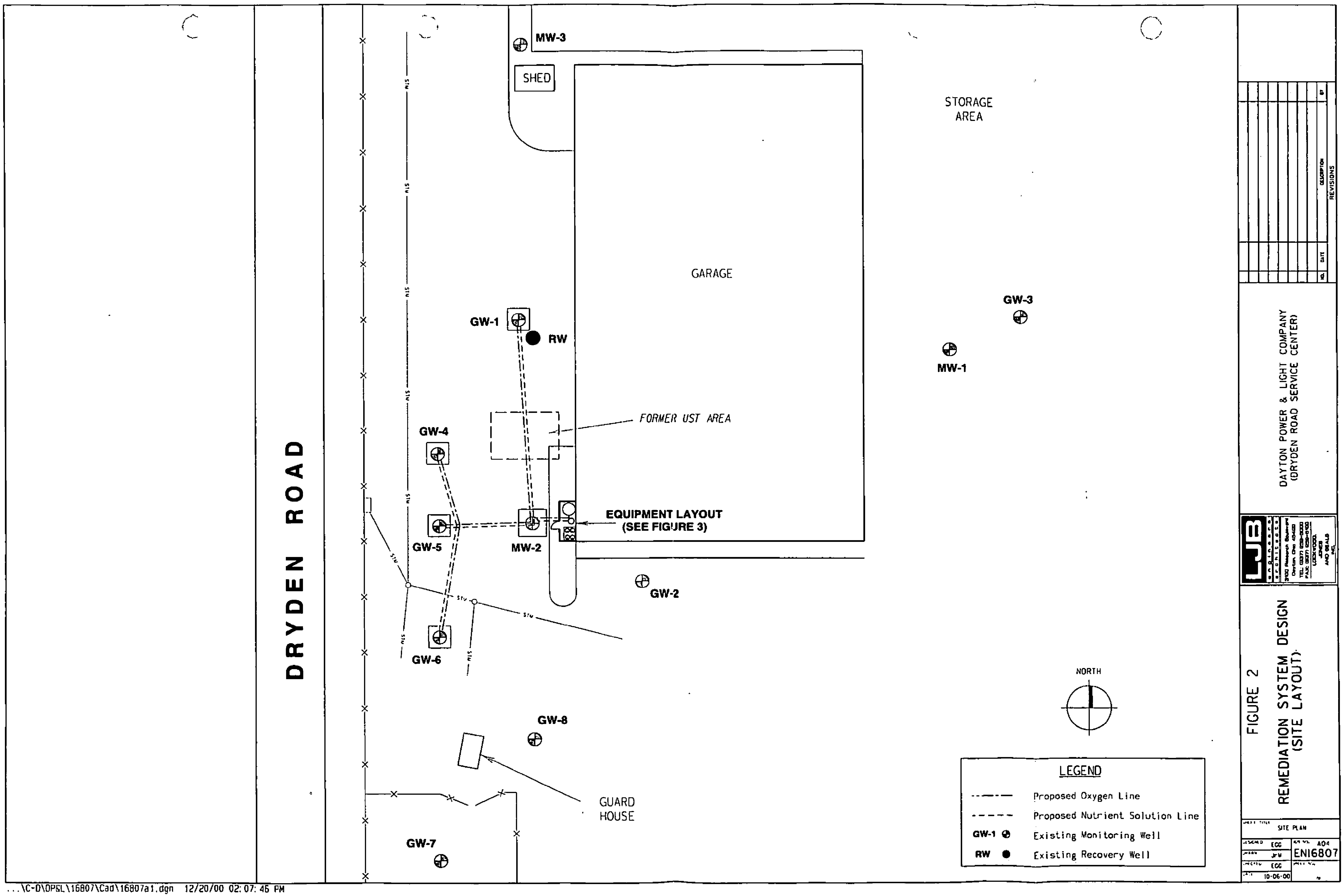
LJB

ENGINEERS & ARCHITECTS
ENVIRONMENTAL SERVICES
3100 Research Blvd, Dayton, OH 45420
Tel: 937-259-5000

EN-16807A.04	10/23/00	By: HDL

FIGURE 1: Location Map | Scale: 1"=2000'

DP&L Transportation Center
Dryden Road
Dayton, Montgomery County, Ohio


MW-3
SHED
STORAGE AREA
GARAGE
GW-3
GW-1
RW
MW-1
FORMER UST AREA
GW-4
EQUIPMENT LAYOUT
(SEE FIGURE 3)
GW-5
MW-2
DRYDEN ROAD
GW-2
GW-6
NORTH
GW-8
GUARD HOUSE
GW-7
LEGEND
Proposed Oxygen Line
Proposed Nutrient Solution Line
GW-1 Existing Monitoring Well
RW Existing Recovery Well
DAYTON POWER & LIGHT COMPANY
(DRYDEN ROAD SERVICE CENTER)
FIGURE 2
REMEDIATION SYSTEM DESIGN
(SITE LAYOUT)
SITE PLAN
ECG
JFM
ECG
10-06-00
A04
ENI6807
...\C-D\OPSL\16807\Cad\16807a1.dgn 12/20/00 02:07:46 PM

prepared by SCS Engineers and submitted to BUSTR in October 1990 which incorporated the results of the investigative work to date (see Appendix E). In July 1994, five additional monitoring wells were installed, GW-4, GW-5, GW-6, GW-7 and GW-8.

ESE, Inc. (Dayton, Ohio) installed a groundwater, pump and treat, air-stripper treatment system in 1995 to remediate the impacted subsurface soils and groundwater. The system was operated from September 1995 until December 1998. Groundwater results collected while the system was operational indicated that the contaminant levels were decreasing slightly. After BUSTR granted permission to determine if the system had adequately achieved cleanup requirements, the following 12 months (1999) involved a "groundwater monitoring only" program for the site. The results of that monitoring program indicated to BUSTR that the groundwater was still impacted with petroleum hydrocarbons and that remediation efforts should continue.

2.0 DISCUSSION OF SITE CHARACTERISTICS

2.1 Summary of Site Assessment Findings

The site assessment activities described above have also provided these findings pertaining to the petroleum hydrocarbon contamination at the property:

1. A total of six USTs were removed from the subject site in 1989, two located adjacent to the southwest wall of the vehicle maintenance building, and four located to the north. No significant contamination was noted from the northern tank closure.

2. Glacial outwash deposits filling pre-glacial or inter-glacial river valleys typify the geology at the subject site. The sand and gravel outwash deposits have been mined extensively in the area of the subject site, and the resultant excavations were often sites of fill or waste deposition. The subject site is characterized by the presence of fill materials, consisting of foundry sand, cinders, metal, clay, etc., beneath the ground surface at a thickness of up to 21 feet. Sand and gravel outwash deposits underlie the fill and were present in the soil borings installed at the site that terminated at depths of approximately 34 feet. Ohio Department of Natural Resources (ODNR) records indicate that the sand and gravel deposits extend to at least 198 feet; clay horizons (glacial till) interbedded between sand and gravel in the vicinity of the site begin at depths between 50 and 80 feet below ground surface. The till may occur locally as lenses or aerially as expansive sheets.

3. Latest groundwater measurements indicate subsurface flow is to the southwest across the property.

4. No drinking water wells were found to be located within a half-mile radius of the transportation center.

5. According to the Site Assessment, only one buried utility was identified on the subject site. A storm sewer pipeline runs parallel with the vehicle maintenance garage, which branches northwest and southeast, as shown in Figure 2.

2.2 Recent Observations and Implications for Remediation

A groundwater, pump and treat, air stripping system was installed at the subject site in September of 1995 by ESE. This system remained in operation until December of 1998. Groundwater sample results indicate that this system had a positive impact in remediating the subsurface (see Table 1), however, the groundwater levels of target compounds, especially benzene, remained at levels which were not acceptable to BUSTR. Recent groundwater results have indicated to BUSTR that benzene concentrations in two of the monitoring wells (GW-4 and GW-5) requires further remediation. These wells are southwest of the former tank farm and in the direction of groundwater flow across the property. Groundwater elevation data collected over the past three to four years has indicated that the impacted water table remains somewhat consistent throughout the year.

In a letter dated November 20, 1999, BUSTR concluded that the contamination in GW-4 and GW-5 had increased to unacceptable levels for a monitoring only remedial action plan. BUSTR required that DP&L either restart the pump and treat system, the previously approved remedial action plan, or propose a new RAP. Due to current site conditions and the ineffectiveness of the previous treatment system to achieve acceptable cleanup levels, LJB has prepared this RAP using bioremediation techniques for this property.

3.0 DISCUSSION OF REMEDIATION ALTERNATIVES

LJB has reviewed various treatment alternatives to address the remaining petroleum hydrocarbon contamination at the subject site. Treatment alternatives addressing only soil remediation were immediately eliminated, since contaminated soil had already been removed during the UST removal, and since the groundwater appears to be the matrix with the significant contamination. Soil vapor extraction with air sparging, pump and treat, and in-situ bioremediation were considered.

Air sparging and soil vapor extraction (SVE) were considered for possible remedial designs. SVE was eliminated due to its inefficiency in saturated media. A dual-phased system consisting of a groundwater pump to lower the water table could allow the SVE design to operate more effectively. However, costs associated with pilot testing and system design eliminated this remedial alternative. Air sparging was considered and is being incorporated into the chosen remedial design.

Air stripping was the previously approved remedial action plan. As discussed in Section 2, this system removed the bulk of the contamination but has not been successful in attaining benzene concentrations deemed acceptable by BUSTR (see Table 1). For example, the benzene concentrations detected from GW-5 were reduced from 12,000 μg/l prior to the pump and treat system operation to 3,100 μg/l, approximately one year after the system was operational. One reason for this inefficiency may be the upgradient location of the recovery well. The groundwater flow at the subject site is to the southwest, and the recovery well is located north of the former UST location, causing the pump to work against the flow of groundwater. Therefore, restarting this system does not represent the best treatment option for the subject site.

Table 1 Analytical Laboratory Results-Benzene Concentrations
(Groundwater Monitoring Wells at DP&L Transportation Center)

Benzene Concentrations (μg/l)

	8/26/94	12/26/95	3/1/96	10/23/97	10/29/99	7/31/00	10/20/00
MW-1	-	**NS**	**4.6**	**BDL**	**4.6**	**BDL**	**BDL**
MW-2	-	**1600**	**1200**	**1230**	**642**	**482**	**319**
MW-3	-	**BDL**	**3.7**	**BDL**	**NS**	**BDL**	**BDL**
GW-2	-	**NS**	**91**	**BDL**	**NS**	**BDL**	**7.6**
GW-3	-	**BDL**	**.86**	**BDL**	**BDL**	**BDL**	**BDL**
GW-4	**12000**	**3100**	**360**	**5390**	**3960**	**1390**	**220**
GW-5	**15000**	**6300**	**1200**	**5400**	**3850**	**6030**	**272**
GW-6	**5000**	**1600**	**310**	**935**	**571**	**842**	**351**
GW-7	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**	**BDL**
GW-8	**BDL**	**14**	**24**	**BDL**	**6.6**	**12.5**	**7.1**

NS = Not Sampled
BDL = Below Detection Limit (Ranges from <2 to <5 μg/l, depending on laboratory)
Shaded area indicates the operational time period of the previous RAP.

4.0 SELECTED REMEDIATION TECHNOLOGY

4.1 Discussion of Bioremediation Technology

In-situ bioremediation, enhanced by air-sparging, involves the injection of inorganic nutrients and air (oxygen) into the aquifer via injection wells. This approach will promote the activity of petroleum-digesting bacteria already present in the soil, and combined with subsurface soil conditions and groundwater flow across the property, makes this method the best treatment alternative for the subject site.

The wells currently present on site provide a means of injecting nutrients and oxygen into the aquifer. In-situ bioremediation will address both the vertical and horizontal extent of the contamination, which has been "smeared" approximately 4 feet by the seasonal changes in the groundwater. This system will allow both the soil and groundwater to be remediated since the bacteria are in contact with both media.

4.2 Description of Treatment System Operation

The bioremediation treatment system (Figure 2) at the DP&L Transportation Center will consist of a system of PVC air lines trenched to each of five converted monitoring wells. An air compressor will be used to supply air to a manifold having a separate pressure gauge and valve for each of the five wells (GW-1, MW-2, GW-4, GW-5, GW-6). A 1 inch diameter Schedule 40 PVC air line with a threaded, 4 foot long, air diffuser on the end will be inserted into the bottom of each well. Air will be directed into the wells at a pressure of approximately 8 to 12 psi.

A nutrient solution (EPA approved and biodegradable) consisting of 20% ammonia, 2% o-phosphate by weight will be injected at a constant rate into each of the wells. The nutrients will be stored in an 800 gallon, HDPE tank to be located in the treatment system building (see Figure #3). Schedule 40 PVC, 1/2 inch in diameter, nutrient lines will be inserted separately into each well. The automated pump delivery system will be set to inject approximately 3-4 gallons of nutrient solution per well, per day, approximately 105-140 gallons of nutrient solution per week at the site.

The remediation system will be inspected weekly, at a minimum, to ensure proper operation and to conduct any maintenance as required.

5.0 SYSTEM PERFORMANCE & TREATMENT OBJECTIVES

5.1 Site Remediation Objectives and Schedule

LJB proposes to monitor the groundwater BTEX levels as a measure of the progress of the remediation. Due to the depth of the contamination, monitoring of soil contaminant levels is not feasible at this site. Since the bioremediation process will affect soil as well as groundwater contamination, the groundwater contaminant levels are considered an appropriate indicator of the remediation process.

While bioremediation is expected to be effective at this site, the exact progress of the degradation of petroleum products is difficult to predict. Therefore, the bioremediation system will be operated for a total of 12-24 months and monitored according to the schedule outlined in Table 2 (System Monitoring Schedule and Analytical Methods). If the remedial objectives have been met within the initial 12 month period that the system is in operation, an application will be made to BUSTR for a finding of "no further action." If the remedial objectives have not yet been met, BUSTR will be notified of the additional actions planned for the site.

5.2 Proposed Reporting Requirements

The progress of the remediation will be monitored according to the monitoring schedule outlined in Table 2. Plate counts for petroleum digesting bacteria will be performed as well. Monthly progress reports will be submitted to DP&L, and quarterly progress reports will be submitted to BUSTR, in the format shown in Appendix E.

6.0 SUMMARY

Based on previous investigations, analytical results, and the performance of the previously utilized remedial technology it was determined that a bioremediation system, consisting of air-sparging and nutrient injection, is the best remedial alternative for the DP&L Transportation Center. A total of five wells will be treated with the bioremediation technology, which will remediate both the groundwater and the soil at the site.

After reviewing all historic records, analytical data and other information pertinent to the subject site, it was determined that cleanup levels for the target compounds (BTEX) would be difficult to set at this time. After the system has been operational for a period of time, and the concentrations of BTEX compounds have reached relatively static levels, a Risk Based Assessment will be performed to determine final cleanup concentrations. This alternative has been discussed and agreed upon by Mr. Ray Bauman, the BUSTR Environmental Specialist.

Table 2 System Monitoring Schedule and Analytical Methods

Frequency	Water Quality Parameter	Analytical Method
Startup & Quarterly Sampling	Plate Counts (CFU's)	Standard Methods (ASTM)
	Groundwater Elevation	On-Site Measurement
	pH	On-Site Measurement
	BTEX	EPA Method 8020
Weekly Inspections	Groundwater Elevation	On-Site Measurement
	pH	On-Site Measurement

Table 3 RAP Implementation Schedule
(Calendar Years 2001/2002)

Task	2001 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	2002 Jan	Feb
Submit RAP for BUSTR Review & Approval	X													
System Installation (Start Up)	X	X												
Sampling & Analysis (Plate Counts, pH, BTEX)	X*	X			X			X			X			X
Inspections, pH & GW Measurements - Weekly		X	X	X	X	X	X	X	X	X	X	X	X	X
Final Report														*see note

*Plate Counts will be conducted prior to system start-up to verify presence of petroleum hydrocarbon degrading bacteria.

*Note: Depending on system operation, after 12 months of operation, a determination will be made to whether a No Further Action status can be pursued.

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APPENDIX A

BUSTR's Remedial Action Plan Request

LJB
Inc

Ohio Department of Commerce
Division of State Fire Marshal
Bureau of Underground Storage Tank Regulations
6606 Tussing Road • P.O. Box 687
Reynoldsburg, OH 43068-9009
(614) 752-7938 FAX (614) 752-7942
www.com.state.oh.us

Bob Taft
Governor

Gary C. Suhadolnik
Director

NOVEMBER 20,1999

SCOTT ARENTSEN
DAYTON POWER & LIGHT
PO BOX 8825
DAYTON OH 45401

SITE: DP&L TRANSPORTATION CENTER
1989 REMOVAL
1900 DRYDEN RD
DAYTON OH OH
MONTGOMERY COUNTY
INCIDENT #579286-00

RE: REMEDIAL ACTION PLAN REQUEST

Dear Mr. Arentsen:

The Bureau of Underground Storage Tank Regulations (BUSTR) reviewed your report titled "Third Quarter Groundwater Monitoring" dated October 28,1999, BUSTR determined that the contamination in GW-4 & GW-5 has increased to unacceptable levels for a monitoring only remedial action plan (RAP). BUSTR has reviewed the files of the properties across the street and has not found a probable source of offsite contamination. BUSTR also requires that DP&L either restart the groundwater pump and treat system (previously approved RAP) or propose a new RAP within 120 days of the date of this letter.

On March 31, 1999, a new corrective action rule became effective. A provision of this rule allows owners/operators with releases confirmed prior to March 31, 1999 to elect to conduct corrective actions under the 1999 rule. A Fact Sheet explaining this option and other revelent publications can be found on the State Fire Marshal's web-site at *www.com.state.oh.us/sfm.*

Thank you for your cooperation. If you have any questions, please contact me at (614) 752-4232.

Sincerely,

Raymond Bauman

Raymond Bauman
Environmental Specialist

xc: Site File
Richard Brinkman, Montgomery Co Wellfield Protection

LJB

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architects

APPENDIX B

Underground Storage Tank Closure Assessment Report

LJB

Closure Assessment of Two
Underground Gasoline Storage Tanks
Dayton Power and Light Company
Transportation Center
1900 Dryden Road
Dayton, Ohio

HunTer/KECK

Closure Assessment of Two
Underground Gasoline Storage Tanks
Dayton Power and Light Company
Transportation Center
1900 Dryden Road
Dayton, Ohio

Prepared for:

Dayton Power and Light Company
Box 1247
Courthouse Plaza Southwest
Dayton, Ohio 45401
ATTN: Ms. Mariann Quinn

Prepared by:

Mr. Mark J. Howell, Geologist
Hunter/Keck, Inc.
521 Byers Road
Suite 101
Miamisburg, Ohio 45342

July 19, 1989

Table of Contents

Tables

Appendices

INTRODUCTION

Hunter/Keck, Inc. (HKI) was retained by Dayton Power and Light Company to perform a closure assessment and to prepare a report demonstrating compliance with Federal Regulations 40 CFR 280.72 and 40 CFR 280.74 for the removal of two underground storage tanks (USTs) and a dispensing island at DP&L's Transportation Center located at 1900 Dryden Road, Dayton, Ohio.

The two USTs at the Transportation Center had been installed in the same basin. The age of the two 10,000-gallon, single-walled sti-P_3 tanks is unknown.

SERVICES PERFORMED

Tank Removals

Hunter/Keck, Inc. supervised the excavation and removal of the underground tanks on April 19, 1989. The contents of each tank were hand-pumped into a new 55-gallon drum.

Potentially explosive vapors were purged from both tanks with dry ice (15 pounds per 1,000 gallons of capacity). Both tanks were punctured prior to their removal from the tank excavation and were visually inspected after removal. Serial number and UL tags were removed from one tank; the tags were previously removed from the second tank (UL tags were apparently removed from the tank at the time the fiberglass interior lining was installed).

Mr. Phil Sinewe, Fire Inspector for the City of Moraine, was on-site during much of the tank removal activities.

Soil Sampling

Excavated soils were periodically field screened with an HNU P.I. 101 photoionization detector (HNU). Additionally seventeen soil samples were screened using field organic vapor headspace monitoring; organic vapor headspace monitoring protocol is presented in Appendix A.

Additional soil samples were collected for laboratory analyses. One sample was collected from the excavation floor following the removal of the storage tanks. The sample was analyzed for benzene, toluene, ethyl benzene, and xylene (collectively designated BTEX), total petroleum hydrocarbons (TPH), and total lead. Three samples were collected following additional excavation. The three samples were composited into one sample in the laboratory and analyzed for BTEX, TPH, and total lead.

RESULTS

Tank Removals

A strong gasoline odor was noted during the excavation of the two underground storage tanks. Visibly contaminated soil and all soil yielding HNU responses were stockpiled on plastic at the site. The resulting soil pile was covered until landfill permits could be obtained.

visual inspection of each excavated tank surface, tank coating, and tank welds revealed fair tank condition. The interior of both tanks had previously been lined with fiberglass. The tank UL and serial number tags were missing from one tank, and were illegible on the other.

Further enlargement of the tank excavation was discontinued in each direction for reasons outlined below:

- o Further excavation to the north and south was discontinued when samples analyzed using vapor headspace techniques registered < 5 ppm (parts per million) on the HNU;
- o Further excavation to the west was limited by the presence of a storm sewer;
- o Further excavation to the east was restricted by the Transportation Center building footer; and
- o Deeper excavation was limited by the groundwater table at 27 feet below grade.

The final excavation dimensions were approximately 35 feet (east/west) by 50 feet (north/south) by 27 feet (depth). The excavation has been backfilled for safety and operational concerns.

Soil Sampling

The results of organic vapor screening using vapor headspace techniques on samples collected adjacent to the tanks and from the excavation walls and floor ranged from no HNU response to 500 ppm. As the tank excavation was enlarged, the excavation wall samples registered < 5 ppm on the HNU (S-7 and S-8, Appendix B). However, two samples collected from the south portion of the excavation floor registered 200 ppm on the HNU (S-5 and S-6, Appendix B). Further excavation of that portion of the pit floor would have increased the risk of structural damage to the nearby Transportation Center building.

Results of the laboratory analyses performed on the soil sample collected from the excavation floor immediately after tank removal (sample T6B), and results of the sample composited from the final excavation floor samples (S-9, S-10, and S-11) are summarized in Table 1.

Table 1

Summary of Laboratory Results

Analyte	Unit	T6B (4/19/89)	S-9,10,11 (5-9-89)
Benzene	ppb	< 100	< 5
Toluene	ppb	94,000	< 5
Ethyl Benzene	ppb	32,000	< 5
Xylenes	ppb	42,000	< 5
Total Petroleum Hydrocarbons	ppm	< 5	130
Total Lead	ppm	3,800	< 5

Samples S-9, S-10, and S-11 were collected from the excavation floor after groundwater was encountered. None of the three samples were collected from the soil zone yielding 200 ppm HNU responses. Although a sheen was noted on the groundwater surface, groundwater samples were not collected due to the difficulty of obtaining a representative water sample from the 27-foot deep excavation. Laboratory reports and chains-of-custody are presented in Appendix C.

CONCLUSIONS

Laboratory analyses of backfill material encountered immediately below the underground tanks detected BTEX concentrations totaling 168,000 ppb (parts per billion). However, BTEX concentrations in a composited soil sample from a depth of 27 feet were below laboratory detection limits (< 5 ppb). The total lead concentrations similarly dropped from 3,800 ppm to < 5 ppm (parts per million). A zone of soil registering 200 ppm during HNU headspace monitoring apparently continued below the Transportation Center building and therefore could not be excavated further.

Appendix A

Organic Vapor Headspace Monitoring Protocol

PROTOCOL FOR ORGANIC VAPOR HEADSPACE SCREENING OF SOIL SAMPLES

Purpose

The purpose of organic vapor screening is to rapidly evaluate a sample for the presence of organic vapors. The procedure does not permit identification of specific organic vapors but does permit the evaluation of relative organic vapor concentrations.

Procedure

Place a representative portion of the sample of interest into a clean 16-ounce wide mouth jar. In order to achieve a relative ranking between samples, it is important to consistently fill the jar to the same level (i.e., halfway full). Once the sample has been placed into the jar, clean aluminum foil is placed over the entire mouth of the jar, taking care not to puncture the foil. After the aluminum foil cover has been put in place, tightly cap the jar with a plastic lid. Warm the jar and contents for approximately 10 minutes. After warming the jar and contents, carefully remove the plastic lid and insert the intake probe of the organic vapor detecting instrument through the foil and into the headspace above the sample. Record the response as indicated on the instrument's dial or display.

Appendix B

Summary of Vapor Headspace Monitoring

APPENDIX B

Summary of Vapor Headspace Monitoring

Sample Number	Date Collected	HNU Response
HS18	4/19/89	15 ppm
HS19	4/19/89	6 ppm
HS20	4/19/89	6 ppm
HS21	4/19/89	1 ppm
HS22	4/19/89	5 ppm
HS23	4/19/89	300 ppm
HS24	4/19/89	30 ppm
HS25	4/19/89	10 ppm
HS26	4/19/89	400 ppm
HS27	4/19/89	500 ppm
HS28	4/19/89	8 ppm
HS29	4/19/89	NR *
HS30	4/20/89	30 ppm
S-5	5/09/89	200 ppm
S-6	5/09/89	200 ppm
S-7	5/09/89	NR *
S-8	5/09/89	NR *

* NR = No Hnu Response

Appendix C

Laboratory Reports
Chain of Custody Records

Brighton Analytical Inc.

1576 Alloy Parkway Phone (313) 887-6364 Highland, Michigan 48031

DATA SUMMARY SHEET

DATE: April 24, 1989

PROJECT: Keck-Ohio
CASE #447-2477

DATE SAMPLES RECEIVED: 4/21/89
DATE SAMPLES ANALYZED: 4/21/89

PARAMETERS	UNITS	T-6-B 4/19
Benzene	mg/kg	<0.1
Ethyl Benzene	mg/kg	94
Toluene	mg/kg	32
Xylenes	mg/kg	42
Total Lead	mg/kg	<5
Total Petroleum Hydrocarbons	mg/kg	3800

HUNTER/KECK

521 Byers Road, Suite 101
Miamisburg, OH 45342
(513) 859-3600 • Fax (513) 859-7951

Sheet 1 of 1

Chain of Custody Record / Sampling Analyses Request

Case and Contract No.	Samplers Name:	Samplers Signature:
447-2477	MARK J. HOWELL	[signature]

Station No.	Station Location	Sample Date	Time	Sample Type	Number of Containers	Laboratory Analyses Required
	P.1	4.21.89	1102	SOIL	3	COMPOSITE FOR ONE SAMPLE
	P.2	4.21.89	1110	SOIL	3	COMPOSITE FOR ONE SAMPLE
	P.3	4.21.89	1323	SOIL	3	COMPOSITE FOR ONE SAMPLE
						RUN EACH COMPOSITED
						SAMPLE FOR
						· FLASH POINT
						· FREE LIQUID
						· REACTIVE CYANIDE
						· REACTIVE SULPHIDE
						· EP TOX LEAD
						· EP TOX CADMIUM

Relinquished By: (signature)	Date/Time	Received By: (signature)	Date/Time
[signature]	4.21.89 1457	Dolly Raidain	4/21/89 14:57
Relinquished By: (signature)	Date/Time	Received By: (signature)	Date/Time
Relinquished By: (signature)	Date/Time	Received By: (signature)	Date/Time
Relinquished By: (signature)	Date/Time	Received By: (signature)	Date/Time

Method of Shipment:	Tracking No.	Received By Laboratory Custodian: (signature)	Date/Time

Remarks:

Brighton Analytical Inc.

1576 Alloy Parkway Phone (313) 887-6364 Highland, Michigan 48031

DATA SUMMARY SHEET

DATE: May 19, 1989

PROJECT: Keck-Ohio
CASE #447-2477

DATE SAMPLES RECEIVED: 5/10/89
DATE SAMPLES ANALYZED: 5/18/89

PARAMETER	UNITS	S-1,3,5,7 Composite 5/8 & 5/9	S-9,10,11 Composite 5/9	HYD. 1,2,3,4,5 Composite 5/9
Benzene	ug/kg	<1	<5	<5
Toluene	ug/kg	<1	<5	<5
Ethyl Benzene	ug/kg	<1	<5	<5
Total Xylenes	ug/kg	<1	<5	<5
Total Petroleum Hydrocarbons	mg/kg	5	130	2900
Total Lead	mg/kg	<5	<5	12

HUNTER/KECK

521 Byers Road, Suite 101
Miamisburg, OH 45342
(513) 859-3600 • Fax (513) 859-7951

Sheet of

Chain of Custody Record / Sampling Analyses Request

Case and Contract No.	Samplers Name:	Samplers Signature:
447-2477	JAMES STEWART	James Stewart

Station No.	Station Location	Sample Date	Time	Sample Type	Number of Containers	Laboratory Analyses Required
0510099	S-1	5/8/89	3:00	SOIL	1 EA	
10100	S-2	"				COMPOSITE 1, 3, 5 AND 7
10101	S-3	"				AND ANALYZE FOR BTEX
10102	S-4	"	3:30			TPH AND TOTAL LEAD
10103	S-5	5/9/89	9:45			
10104	S-6		9:45			PLEASE HOLD SAMPLES
10105	S-7		10:10			2, 4, 6, 8 FOR POSSIBLE
10106	S 8		10:00			FUTURE ANALYSIS
10107	S-9	5/9/89	11:45			COMPOSITE INTO ONE SAMPLE
10108	S-10		11:45			ANALYZE FOR BTEX, TPH,
10109	S 11		11:45			AND TOTAL LEAD
10110	HYD 1	5/9/89	8:00			COMPOSITE INTO ONE
10111	HYD 2					SAMPLE AND ANALYZE
10112	HYD 3					FOR BTEX, TPH AND
10113	HYD 4					TOTAL LEAD
10114	HYD 5					

Relinquished By: (signature)	Date/Time	Received By: (signature)	Date/Time
James Stewart	5/9 17:00	Michele LeSeu	5/9 1700
Federal Express	5/10 10:30a	Amoelke	5/10 10:30a

Method of Shipment:	Tracking No.	Received By Laboratory Custodian: (signature)	Date/Time
FEDERAL EXPRESS	2930866500		

Remarks:
RETURN THIS ORIGINAL WITH LAB REPORT
FAX LAB RESULTS AS SOON AS POSSIBLE

APPENDIX C

Site Investigation

ED_001207_00000832

Site Investigation Performed at
Dayton Power and Light Company
Transportation Center
1900 Dryden Road
Dayton, Ohio

HunTer/KECK

Site Investigation Performed at
Dayton Power and Light Company
Transportation Center
1900 Dryden Road
Dayton, Ohio

Prepared for:

Dayton Power and Light Company
Box 1247
Courthouse Plaza Southwest
Dayton, Ohio 45401
ATTN: Ms. Mariann Quinn

Prepared by:

Mr. David B. Kearns, Project Manager
Hunter/Keck, Inc.
521 Byers Road
Suite 101
Miamisburg, Ohio 45342

November 6, 1989

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INTRODUCTION

Hunter/Keck, Inc. (HKI) was retained by the Dayton Power and Light Company (DP&L) to perform a site investigation at DP&L's Transportation Center, 1900 Dryden Road, Dayton, Ohio. The general site location is shown on Figure 1. The site investigation was performed pursuant to Rule 1301:7-7-36(c)(3) of the Ohio Administrative Code, which governs corrective actions and cost recovery standards for petroleum underground storage tank (UST) releases. The purpose of this report is to present the findings of the site investigation.

BACKGROUND

In April of 1989, two 10,000-gallon underground storage tanks (USTs) which had contained gasoline were removed from service. Both tanks were single-walled, $StiP_3$ tanks that were located in the same tank basin. The tanks were approximately four years old. Visual inspection of each excavated tank surface, tank coating, and tank welds revealed fair tank conditions. The interior of both tanks had previously ben lined with fiberglass. During removal of the USTs, a gasoline odor was noted. In an effort to remove residual petroleum hydrocarbons, additional excavations were performed. Excavation terminated on May 9, 1989. The final excavation dimensions were approximately 35 feet (east/west) by 50 feet (north/south) by 27 feet deep. Four other underground storage tanks located north of the gasoline tanks were also removed. The northern tank basin was a clean closure. Details of the closure

Site Location
Dayton Power & Light
Dryden Road

1900 Dryden Road
Moraine Township
Montgomery County
Dayton, Ohio

FIGURE 1

feet
0 2000 4000

N

Adapted from 7.5' USGS topographic quadrangle: Dayton South, 1981.

may be found in HKI's report entitled, "Report of Underground Storage Tank Closure Assessment", dated May 25, 1989.

Further enlargement of the gasoline tank cavity was discontinued in each direction for the following reasons:

a. Further excavation to the north and south was discontinued when soil samples analyzed using vapor headspace techniques registered < 5 ppm (parts per million) on the HNU photoionization detector.
b. Further excavation to the west was limited by the presence of a storm sewer.
c. Further excavation to the east was restricted by the Transportation Center building footer.
d. Deeper excavation was terminated when groundwater was encountered at a depth of 27 feet below grade.

Soil samples were collected from three locations on the floor of the excavation, composited, and analyzed as a single sample for total lead, TPH (total petroleum hydrocarbons), and BTEX compounds (benzene, toluene, ethyl benzene, and total xylenes). The results of the laboratory analyses performed on the composite soil sample are presented in Table 1.

Table 1

Results of Laboratory Analyses Performed on
Composited Soil Sample - Floor of Tank Cavity
Final Excavation

Analyte	Unit	Detected Concentration
Benzene	ppb	< 5
Toluene	ppb	< 5
Ethyl Benzene	ppb	< 5
Total Xylenes	ppb	< 5
Total Lead	ppm	< 5
Total Petroleum Hydrocarbons	ppm	130

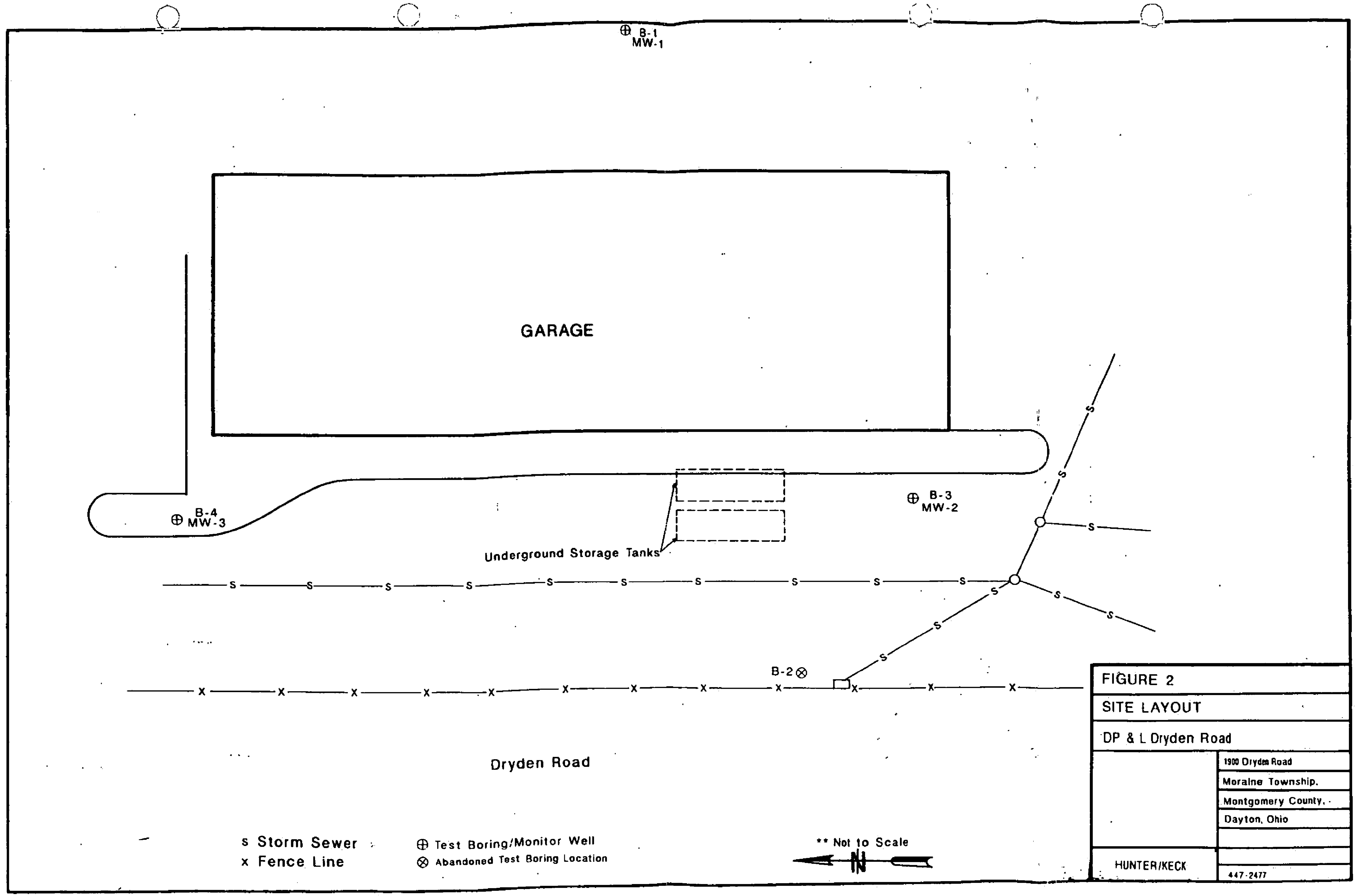
ppb = parts per billion
ppm = parts per million

SITE DESCRIPTION

The DP&L Transportation Center is located at 1900 Dryden Road, Dayton, Ohio. A vehicle maintenance facility is located on the southwestern portion of the property. The previously removed gasoline USTs were located outside of the vehicle maintenance facility adjacent to the southwestern wall. The surface area in the vicinity of the former UST location prior to tank removal was primarily asphalt and concrete. At the time this investigation was conducted, the tank cavity had been backfilled; however, the area of disturbed asphalt had not been repaved. A general site layout is shown on Figure 2.

SCOPE OF WORK

To acquire the necessary data to prepare the site investigation report, Hunter/Keck, Inc.:


B-1
MW-1
GARAGE
B-4
MW-3
B-3
MW-2
Underground Storage Tanks
B-2
Dryden Road
s Storm Sewer
x Fence Line
Test Boring/Monitor Well
Abandoned Test Boring Location
** Not to Scale
N
FIGURE 2
SITE LAYOUT
DP & L Dryden Road
1900 Dryden Road
Moraine Township,
Montgomery County,
Dayton, Ohio
HUNTER/KECK
447-2477

1. Performed a soil boring program, which consisted of drilling four test borings;
2. Completed three of the four test borings as groundwater monitoring wells;
3. Submitted groundwater samples to a laboratory for analyses;
4. Reviewed available literature to evaluate local and regional hydrogeological conditions, and surrounding land use;
5. Performed a search of the Ohio Department of Natural Resources water well log files to identify water wells located in the vicinity of the site.

SITE INVESTIGATION

Test Borings

Four test borings (designated B-1 through B-4) were drilled at the site. Soil samples were collected at approximately five foot intervals from each test boring to define subsurface lithology. Test borings were drilled using 4¼-inch I.D. hollow stem auger drilling techniques. Soil samples were obtained using 2-inch I.D. by 24-inch long split-spoon samplers. Upon recovery from the borehole, each sampler was placed on clean aluminum foil and opened. The amount of soil recovered was measured and the sample characterized by the on-site geologist. Each soil sample was screened for organic vapors using an HNU P.I. 101 photoionization detector. Results of the organic vapor screening performed on soil samples obtained from test borings are presented in Table 2. A summary of test boring depths, depths at which saturation was encountered, and descriptions of identified zones of saturation are presented in Table 3. Test boring logs are presented in Appendix A.

All downhole drilling equipment was decontaminated between boring locations using a high pressure hot water washer. Sampling equipment was decontaminated between successive sampling intervals by washing in a liquinox soap solution, followed by a double rinse in potable water, a final rinse with distilled water, and air drying.

Groundwater Monitoring Wells

Test borings B-1, B-3, and B-4 were completed respectively as groundwater monitoring wells MW-1, MW-2, and MW-3. Test boring B-2 was not completed as a monitoring well because of auger refusal at 26 feet. Groundwater monitoring well locations are shown on Figure 2. Groundwater monitoring well completion diagrams and construction details are presented in Appendix B. Following installation, monitoring wells MW-1 and MW-2 were developed using a Keck submersible pump. Monitoring well MW-3 was developed using a hand bailer. The top of well casing elevation and ground surface elevation for each monitoring well was established by survey. An arbitrary reference was established because of the absence of a local U.S.G.S. benchmark. The left pointing arrow on a fire

Table 2

Results of Organic Vapor Screening Performed on Soil Samples Obtained from Test Borings
(All responses in parts per million - ppm)

TEST BORING B-1

Sample Number	Sample Depth (Feet-BGL)	Instrument Response
B1-1	4 - 6	< 1
B1-2	9 - 11	< 1
B1-3	14 - 16	< 1
B1-4	19 - 21	< 1
B1-5	24 - 26	< 1
B1-6	29 - 31	< 1
B1-7	34 - 36	15 - 20

TEST BORING B-2

Sample Number	Sample Depth (Feet-BGL)	Instrument Response
B2-1	4 - 6	< 1
B2-2	9 - 11	< 1
B2-3	14 - 16	< 1
B2-4	19 - 21	< 1

Auger refusal at 26 feet

TEST BORING B-3

Sample Number	Sample Depth (Feet-BGL)	Instrument Response
B3-1	4 - 6	< 1
B3-2	14 - 16	< 1
B3-3	19 - 21	< 1
B3-4	24 - 26	< 1
B3-5	29 - 31	9
B3-6	34 - 35	300

TEST BORING B-4

Sample Number	Sample Depth (Feet-BGL)	Instrument Response
B4-1	14 - 16	1
B4-2	21 - 23	1
B4-3	24 - 26	1
B4-4	29 - 31	< 1

BGL = Below Ground Level

Table 3

Summary of Test Boring Completion Depths, Depths at Which Saturation was Encountered, and Description of Identified Zone of Saturation

Test Boring Number	Completion Depth Feet - BGL	Depth at Which Saturation Was Encountered Feet - BGL	Description of Saturated Zone
B-1	37	27	Sand and gravel
B-2	27	26	Sand and gravel
B-3	36	26	Sand and gravel
B-4	31	26	Sand and gravel

BGL = Below Ground Level

HunTER/KECK

hydrant located on the west side of the Transportation Center building was assigned an elevation of 100 feet. Depth to groundwater was measured in each of the three monitoring wells on September 12, 1989 and groundwater elevations were calculated. Table 4 presents a summary of groundwater monitoring well elevational data and depth to groundwater data.

LABORATORY ANALYSES

To evaluate groundwater quality, groundwater samples were collected on September 12, 1989 from each of the three groundwater monitoring wells. All laboratory analyses were performed by Chemrox Laboratories, Inc. in Shelton, Connecticut. Prior to sample collection, each groundwater monitoring well was purged of at least three volumes of groundwater. Following the purging process, pH, temperature, and specific conductance were measured and recorded. Groundwater samples were collected with Teflon bailers. Immediately prior to sample collection at each well a bailer blank was collected. Groundwater samples and bailer blank samples were poured directly from the bailers into appropriate sample containers. Groundwater monitoring field data log sheets summarizing the purging and sampling data are presented in Appendix C. All groundwater samples and bailer blank samples were analyzed for total petroleum hydrocarbons, dissolved lead, and BTEX compounds (benzene, toluene, ethyl benzene, and total xylenes). A summary of the results of the laboratory analyses performed on the groundwater and bailer blank samples is presented in Table 5.

Table 4

Groundwater Monitoring Well Elevational Data and
Depth to Groundwater Data

Monitoring Well/Test Boring Number	Date Installed	Ground Surface Elevation	T.O.W.C.* Elevation	9/12/89 Depth to Groundwater From T.O.W.C.*	9/12/89 Static Groundwater Elevation
MW1/B1	8/01/89	98.39	97.80	26.40	71.40
MW2/B2	8/24/89	98.19	97.86	26.58	71.28
MW3/B4	8/28/89	98.55	98.65	27.27	71.38

All elevational data reported in feet above an arbitrary datum.

* T.O.W.C. = Top of Well Casing

Table 5

Summary of the Results of Laboratory Analyses
Performed on Groundwater Samples and Bailer Blank Samples

(All concentrations in parts per million)

Test Boring/ Monitoring Well No.	Date Sampled	Benzene	Toluene	Ethyl Benzene	Xylenes	TPH	Total Lead
MW-1	9/12/89	U	U	2.900	1.100	36	< 0.006
MW-2	9/12/89	3.700	11.000	6.100	7.500	58	0.010
MW-3	9/12/89	U	U	U	U	< 1	0.018
Bailer Blank Number							
Pre MW-1	9/12/89	U	U	U	U	NA	NA
Pre MW-2	9/12/89	U	U	U	0.0098	NA	NA
Pre MW-3	9/12/89	U	0.005	U	0.012	NA	NA

U = Below laboratory detection limit; detection limit presented on laboratory report.

NA = Parameter not analyzed

Laboratory reports, quality control data, and the chain-of-custody record are presented in Appendix D.

GENERAL HYDROGEOLOGIC SETTING

The geologic setting in the Dayton, Ohio area is that of buried pre-glacial or inter-glacial river valleys eroded into relatively horizontal sedimentary bedrock strata. During the ensuing glacial stages, these wide, deeply cut valleys were filled with sediments, some to the point of obscurity, which left the terrain with its present appearance. Geologic materials filling the valleys consist principally of sand and gravel outwash deposits and glacial till which occurs as lenses and layers interbedded with the sand and gravel. Glacial till, which was deposited directly by the ice as it moved over the area, is a heterogeneous mixture of clay and stones and lacks assortment or stratification.

Outwash deposits in the Dayton area range in thickness from about 120 to 250 feet. They are the primary source of the large groundwater supplies that are pumped for municipal and industrial use. In some parts of the Dayton area, well-defined till sheets, buried by 30 to 60 feet of sand and gravel, extend almost entirely across the major valleys and separate the outwash deposits into two or more distinct aquifers. Being relatively impermeable, till is also a major factor in the hydrologic cycle in the Dayton area as it slows recharge to underlying permeable deposits.

In places this till-rich zone is made up of well-defined aerially extensive till sheets; elsewhere it consists of numerous lenses and irregular masses of till grouped closely together at approximately the same altitude. In small areas, notably in the Mad River valley immediately below Eastwood Park, the till is either absent from the sand and gravel deposits or consists only of a few scattered lenses.

The upper surface of the till-rich zone lies generally 30 to 50 feet below the land surface in downtown Dayton. The base of the zone, which is much more irregular than the upper surface, ranges from about 60 to 125 feet below land surface. These levels are somewhat arbitrary as the sand and gravel deposits both above and below the till-rich zone contain scattered lenses and masses of till that make it difficult in places to correlate the deposits.

Locally, in the Miami River valley in central and northern Dayton, and more extensively in the Mad River valley downstream from Findlay Street, the till-rich zone consists of two layers, separated by several feet of sand and gravel. The upper till layer generally is thinner and less extensive than the lower till layer. Although locally the intervening sand and gravel constitutes a separate aquifer, it is considered part of the upper aquifer.

The bedrock bounding the glacial outwash deposits consists of shale interbedded with thin crystalline layers of limestone. In the upper few feet where this unit was subjected to weathering, fractures and openings along bedding planes are capable of conveying minor amounts of groundwater to wells. The remainder of the unit is considered impermeable.

Upland glacial deposits, consisting mostly of till and clay and minor amounts of sand and gravel, overlie the bedrock along the aquifer boundaries or valley walls and provide some recharge to the outwash aquifer. For the most part, however, the upland deposits and the bedrock are less prolific sources of water and used primarily for farm and domestic water supplies.

SITE SPECIFIC HYDROGEOLOGIC SETTING

The information obtained during installation of the four test borings was used to evaluate the site specific hydrogeological setting. HKI also conducted a search of the Ohio Department of Natural Resources water well log file. Well logs for all located water wells within a 2,500-foot radius of the site were obtained. All known wells are industrial wells. Figure 3 presents the location of these water wells in relationship to the site. Copies of these water wells logs are presented in Appendix E.

The hydrogeologic setting at the site is as follows:

Fill material which varying in composition from sand and gravel to sandy gravel and silty clay was encountered from beneath the

Industrial Well Locations
Dayton Power & Light
Dryden Road
1900 Dryden Road
Moraine Township
Montgomery County
Dayton, Ohio

FIGURE 3

1● Industrial Well Location

feet
0 2000 4000

N

Adapted from 7.5' USGS topographic quadrangle: Dayton South, 1981.

asphalt to depths ranging from 16 to 21 feet below ground level. Fill material was identified from ground surface to a depth of 27 feet BGL on one of the water well logs obtained from ODNR. Beneath the fill material, all test borings drilled by HKI encountered sand and gravel deposits and occasional boulders. Groundwater was encountered in each of the test borings between 26 and 27 feet BGL. Review of the water well logs indicates that a clay horizon may be present beneath the site at a depth between 40 and 60 feet BGL. Based on groundwater measurement obtained on 9/12/89, the direction of groundwater flow is to the southwest. The piezometric surface as observed on 9/12/89 is shown on Figure 4.

SURROUNDING LAND USAGE

The areas to the east and west of the site are primarily used for light industrial and commercial purposes. Surrounding facilities include the old Tait Generating Station, a trucking terminal, and metal fabrication facilities. A residential trailer park is located to the southeast of the site.

Appendix A

Test Boring Logs

BORING/WELL LOG DATA

KECK CONSULTING SERVICES, INC.

PROJECT: DP&L: Dryden Road	WELL/BORING No.: MW-1/B-1
LOCATION: Dayton, Ohio	DATE DRILLED: 8/1/89
DRILLING METHOD: Hollow Stem Auger	CASING TYPE/DIA.: Schd. 40 PVC/2-inch
TOTAL DEPTH DRILLED: 37 feet	TOTAL CASING: 34.45 feet
GROUND ELEVATION: 98.39 feet	T.O.C. ELEVATION: 97.80 feet
GROUT TYPE/QUANTITY: Bentonite and Cement/ approx. 75 gallons	SCREEN TYPE/LENGTH: PVC/10 feet
GROUT INTERVAL(S): Surface to 21 feet	SCREENED INTERVAL: approx. 24.4 to 34.4 feet
DEPTH TO WATER: approx. 27 feet	GRAVEL PACK TYPE: Keck #50
WATER LEVEL ELEVATION:	GRAVEL PACK INTERVAL: 23 to 25 feet
	STATIC WATER LEVEL: 26.40 feet DATE: 9/12/89
REMARKS: All elevational data has been referenced to an arbitrary benchmark.	
LOGGED BY: Timothy F. Hebert	SIGNATURE:

In feet DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - .5		Asphalt
.5 - 7.5		Sand and Gravel; Coarse gravel, well rounded, medium to fine sand, brown, not saturated, fill material
7.5- 16		Sandy Clay; black-brown, moist, disturbed soils (fill) containing glass and oxidized metal, not saturated, minor perched water may be present at approx. 14 feet, identified a thin stringer of brown clay at 15.5 feet, poor cutting returns, brown clay contains some medium to coarse gravel and was cohesive.
16 - 37		Sand and Gravel; medium to coarse and and gravel, hard drilling due to large cobbles, poorly sorted with some silts, appears saturated at approximately 27 feet

SPLIT SPOON SAMPLING

Interval	Number	Blow Counts	Recovery	PID	Comments
4 - 6	SS1	7,21,22,27	approx. 10 inches	< 1 ppm	Sand and gravel, brown, not saturated
9 - 11	SS2	4,4,6,10	approx. 10 inches	< 1	Sandy Clay, black-brown
14 - 16	SS3	6,8,10,20	approx. 17 inches	< 1	Sandy Clay, ASA to 15.5 feet, brown clay to 16 feet
19 - 21	SS4	6,8,10,12	approx. 10 inches	< 1	Sand and gravel, brown, medium to coar
24 - 26	SS5	18,18,19,22	approx. 9 inches	< 1	Sand and gravel, ASA
29 - 31	SS6	44,25,22	approx. 11 inches	< 1	Sand and gravel, ASA
34 - 36	SS7	23,27,44	Not recorded	40-50 ppm	Sand and gravel, ASA, soil sample

BORING/WELL LOG DATA

KECK CONSULTING SERVICES, INC.

PROJECT: DP&L: Dryden Road	WELL/BORING No.: MW-2/B-3
LOCATION: Dayton, Ohio	DATE DRILLED: 8/25/89
DRILLING METHOD: 4¼-inch Hollow Stem Auger	CASING TYPE/DIA.: PVC/2.0 inch
TOTAL DEPTH DRILLED: 36 feet BGL	TOTAL CASING: 35.62 feet
GROUND ELEVATION: 98.19 feet	T.O.C. ELEVATION: 97.86 feet
GROUT TYPE/QUANTITY: See groundwater monitoring wellcompletion diagrams	SCREEN TYPE/LENGTH: 0.010 PVC/10 feet
GROUT INTERVAL(S): "	SCREENED INTERVAL: 25.6 to 35.6 feet
DEPTH TO WATER: 26.0 feet BGL	GRAVEL PACK TYPE: No. 5 Quartz Sand
WATER LEVEL ELEVATION:	GRAVEL PACK INTERVAL: 23.8 to 36.1 feet
	STATIC WATER LEVEL: 26.58 ft. DATE: 9/12/89

REMARKS: One sample every 5 feet; BGL = below ground level

LOGGED BY: Paul Stork | SIGNATURE:

In feet DEPTH.	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - .5		Asphalt
4 - 6	B3-1	0.75 feet Fill, fine gravelly sand, some medium and coarse sand,
10,30,44,19	1045	trace silt and clay, poor sorting and subrounded to sub-
		angular, dry, tan. 0.75/2.0 Recovery
9 - 11		No recovery, pushed cobble. Note: at 7.0 feet, auger cuttings were
12,12,11,6		black, sandy gravel, with coal ash-like odor (fill)
14 - 16	B3-2	0.8 feet Fill, silty clay, some medium sand and cinders, moist,
3,12,15,10	1103	low plasticity, black, roofing tar odor
		0.2 feet Fine gravelly clay, medium plasticity, slightly moist, tan
		1.0/2.0 Recovery
19 - 21	B3-3	0.7 feet Fill, medium sand and fine gravel with clay, poor
12,15,10		sorting, slightly moist, tan. 0.7/2.0 Recovery
24 - 16	B3-4	0.5 feet Pounded through quartzite coarse gravel
87-106-37,19	1135	0.4 feet Fine gravel with coarse, medium, and fine sand, trace silt,
		poor sorting, moist, tan
		0.1 feet Fine gravelly clay, trace medium sand, medium plasticity,
		moist, tan, tip of spoon was saturated with water
		1.0/2.0 Recovery

BORING/WELL LOG DATA

KECK CONSULTING SERVICES,INC.

PROJECT: DP&L: Dryden PAGE: 2 DATE: 8/25/89 WELL/BORING No.: B-3

In feet DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
29 - 31	B3-5	0.8 feet Fine gravel, some coarse sand, trace silt and fine sand,
	1147	poor sorting, saturated, brown, slight hydrocarbon odor
		0.8/2.0 Recovery
34 - 35	B3-6	0.9 feet Fine gravel, trace coarse sand, well sorted, sub-
46,100/4	1206	rounded, grading into medium sand with fine sand, trace
		fine gravel and coarse sand, moderate sorting, saturated,
		brown, hydrocarbon odor. 0.8/0.9 Recovery

BORING/WELL LOG DATA
KECK CONSULTING SERVICES, INC.

PROJECT: DP&L: Dryden Road	WELL/BORING No.: B-2
LOCATION: Dayton, Ohio	DATE DRILLED: 8/3/89
DRILLING METHOD: Hollow Stem Auger	CASING TYPE/DIA.: N/A
TOTAL DEPTH DRILLED: 27 feet	TOTAL CASING: N/A
GROUND ELEVATION: 98.19 feet	T.O.C. ELEVATION: N/A
GROUT TYPE/QUANTITY: Bentonite and Cement/ approx. 90 gallons	SCREEN TYPE/LENGTH: N/A
GROUT INTERVAL(S): 0 - 27 feet	SCREENED INTERVAL: N/A
DEPTH TO WATER: approx. 26 feet	GRAVEL PACK TYPE: N/A
WATER LEVEL ELEVATION: N/A	GRAVEL PACK INTERVAL: N/A
	STATIC WATER LEVEL: N/A DATE:

REMARKS: The ground elevation at B-2 has been referenced to a benchmark of 100 feet. Was abandoned due to auger refusal.

LOGGED BY: Timothy F. Hebert | SIGNATURE:

In feet DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 -..5		Asphalt
.5 - 6		Sand and Gravel; coarse gravel with medium to fine sand, brown, not saturated, fill material
6 - 17		Sandy Clay; black-brown, medium to fine sand, some indications of minor perched water at approximately 7 feet, soils are fill material as glass and oxidized metal fragments are present in cuttings
17 - 27		Sand and Gravel; brown, medium to coarse well rounded gravel, medium to coarse sand, poorly sorted, moist, saturation appears to be approximately 26 feet. Auger refusal at 27 feet, decided to abandon borehole and re-drill. Was bentonite/cement grouted through the augers to the near surface and plugged with granual bentonite. No well installed.

SPLIT SPOON SAMPLING

Interval	Number	Blow Counts	Recovery	PID	Comments
4 - 6	1	8, 8, 10, 11	approx. 12 inches	< 1	Sand & gravel, brown, fill
9 - 11	2	6, 6	approx. 8 inches	< 1	Sandy Clay, black-brown, fill
14 - 16	3	6, 8, 17	approx. 5 inches	< 1	ASA, fill
19 - 21	4	74, 26	approx. 12 inches	< 1	Sand and gravel, brown
24 - 26	5	17, 16, 17	no sample retained	NA	

BORING/WELL LOG DATA

KECK CONSULTING SERVICES, INC.

PROJECT: DP&L: Dryden Road	WELL/BORING No.: M-4
LOCATION: Dayton, Ohio	DATE DRILLED: August 28, 1989
DRILLING METHOD: Hollow Stem Auger	CASING TYPE/DIA.: PVC Sch. 40/2-inch
TOTAL DEPTH DRILLED: 31 feet	TOTAL CASING: Approx. 31 feet
GROUND ELEVATION: 98.55 feet	T.O.C. ELEVATION: 98.65 feet
GROUT TYPE/QUANTITY: Granular Bentonite/100 lbs. Bentonite Cement/45 gal.	SCREEN TYPE/LENGTH: PVC/10 feet
GROUT INTERVAL(S): 15 to 18 feet 1 to 15 feet	SCREENED INTERVAL: 21 to 31 feet
DEPTH TO WATER: Approx. 26 feet	GRAVEL PACK TYPE: Natural Keck #5
WATER LEVEL ELEVATION:	GRAVEL PACK INTERVAL: 26 to 31 feet 18 to 26 feet
	STATIC WATER LEVEL: 27.27 ft. DATE: 9/12/89

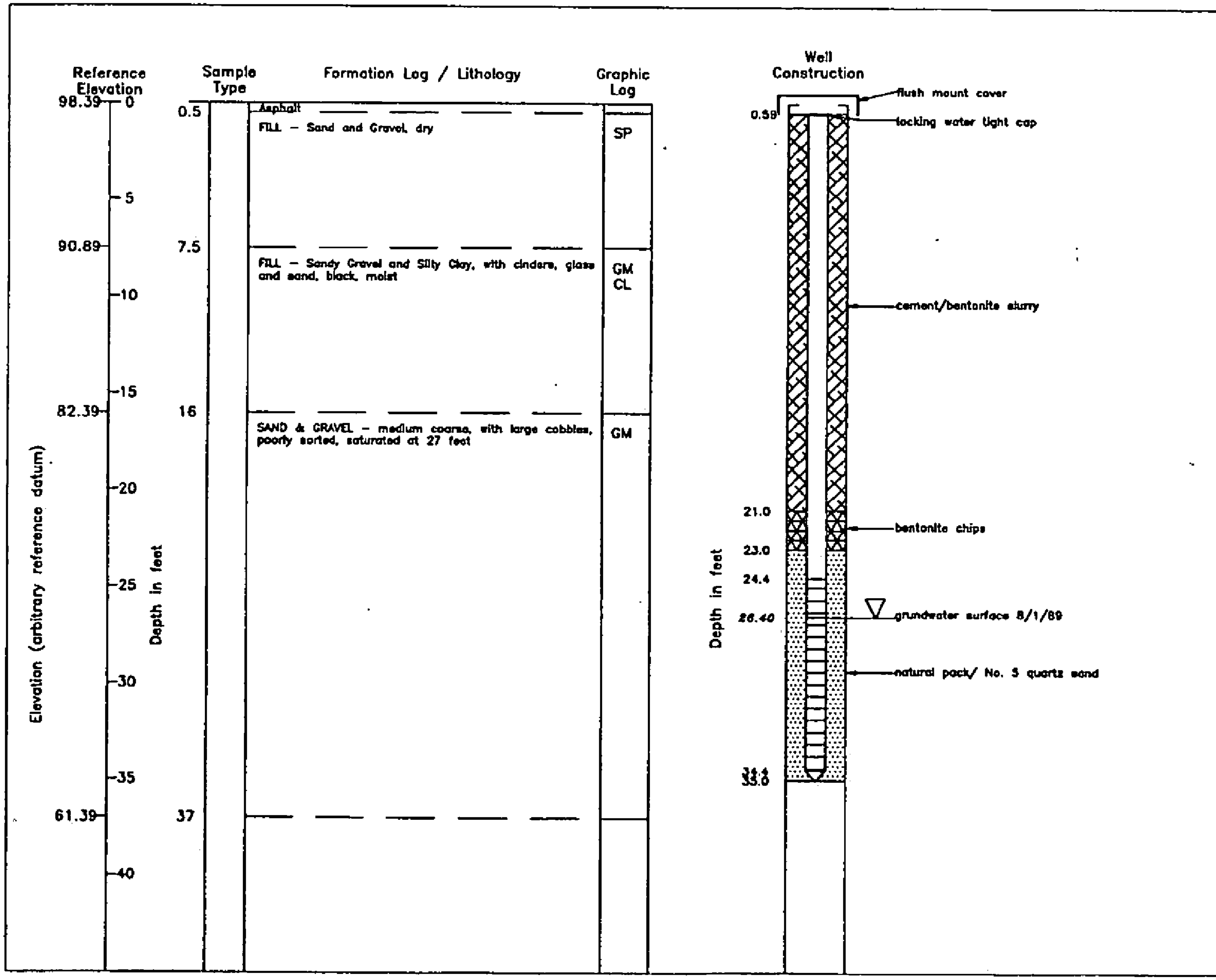
REMARKS: M-4 is re-drill boring for B-4; No split-spoon samples collected at M-4

LOGGED BY: Timothy F. Hebert	SIGNATURE:

DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
		General Interpretation:
0 - 3"		Asphalt
3" - 1.5'		Backfill; grade stone
1.5 - 6'		Backfill; sand and gravel, brown, moist
6 - 14'		Sandy Clay; black, moist, appears to be fill material, saturated or perched zone of medium fine sand at approximately 11 feet, occasional fine gravel, increase gravel with depth, rough drilling at 14 feet
14 - 31'		Sand and Gravel; moist, medium coarse, poorly sorted, interbeds and gray-brown silt and clay indicated by drilling pressure. Rough drilling, break in drill pressure at 21 feet, poor cutting returns, refusal at 31 feet. Unit contains some substantial well rounded cobbles.

Appendix B

Groundwater Monitoring Well Completion Diagrams



KECK CONSULTING SERVICES, INC.
WELL INSTALLATION INFORMATION

Well Number: MW-1 Total Depth: 34.45 feet Below Top of Casing

KCS Representative: Tim Hebert

Started: 8/01/89 Completed: 8/01/89

Drilling Method: 4 1/4-inch Hollow Stem Auger

Well Cover: Flush Mount Cap: Locking Water Tight

Riser: Diameter: 2.0 inches

Material: PVC

Joints: Machine Flush Threaded

Length: 24.80 Feet

Riser Interval: -0.58 to 24.4'

Screen: Diameter: 2.0 inches

Material: PVC

Type: Machine

Slot: 0.010 inches

Length: 10.0 Ft.

Screened Interval: 24.4 Ft. to 34.4 Ft.

Grout Material: Cement/Bentonite Slurry

Quantity: 75 Gallons

Interval: Surface to 21.0 Feet

Seal Material: Bentonite Chips

Quantity: 100 lbs.

Seal Interval: 21.0 Ft. to 23.0 Ft.

Filter Pack Material: Natural Pack/ No. 5 Quartz Sand

Quantity: 200 lbs.

Filter Interval: 23.0 Ft. to 35.0 Ft.

Depth to Groundwater: 26.40 Ft. BTOC

Date: 8/11/89

GROUNDWATER MONITORING WELL COMPLETION DIAGRAM

TEST BORING B-1

WELL MW-1

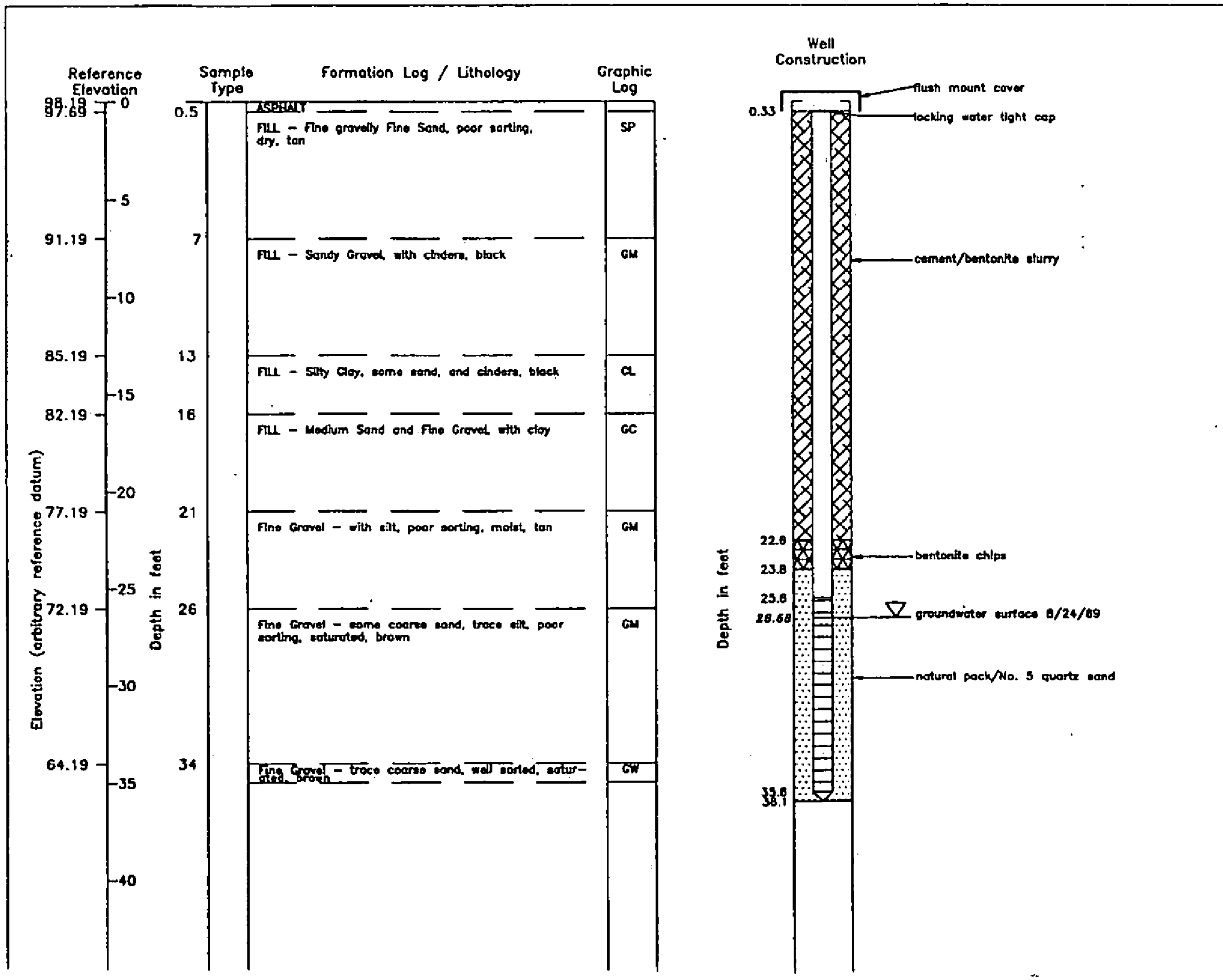
SHEET 1 of 1 DATE 10/4/89

CLIENT Dayton Power & Light

LOCATION Dryden Road

PROJECT 447-2477

HunTen/KECK



KECK CONSULTING SERVICES, INC.
WELL INSTALLATION INFORMATION

Well Number: MW-2 Total Depth: 35.83 Feet Below Top of Casing

KCS Representative: Paul Stork

Started: 8/24/89 Completed: 8/24/89

Drilling Method: 6 1/4-inch Hollow Stem Auger

Well Cover: Flush Mount Cap: Locking Water Tight

Riser: Diameter: 2.0 inches

Material: PVC

Joints: Machine Flush Threaded

Length: 25.10 Feet

Riser Interval: -0.33 to 25.6 Feet

Screen: Diameter: 2.0 inches

Material: PVC

Type: Machine

Slot: 0.010 inches

Length: 10.0 Ft.

Screened Interval: 25.6 Ft. to 35.6 Ft.

Grout Material: Cement/Bentonite Slurry

Quantity: 80 Gallons

Interval: Surface to 22.6 Feet

Seal Material: Bentonite Chips

Quantity: 50 lbs.

Seal Interval: 22.6 Ft. to 23.8 Ft.

Filter Pack Material: Natural Pack/ No. 5 Quartz Sand

Quantity: 100 lbs.

Filter Interval: 23.8 Ft. to 36.1 Ft.

Depth to Groundwater: 26.56 Ft. BTOC

Date: 9/11/89

GROUNDWATER MONITORING WELL COMPLETION DIAGRAM

TEST BORING B-2

WELL MW-2

SHEET 1 of 1 DATE 10/4/89

CLIENT Dayton Power & Light

LOCATION Dryden Road

PROJECT 447-2477

HunTec/KECK

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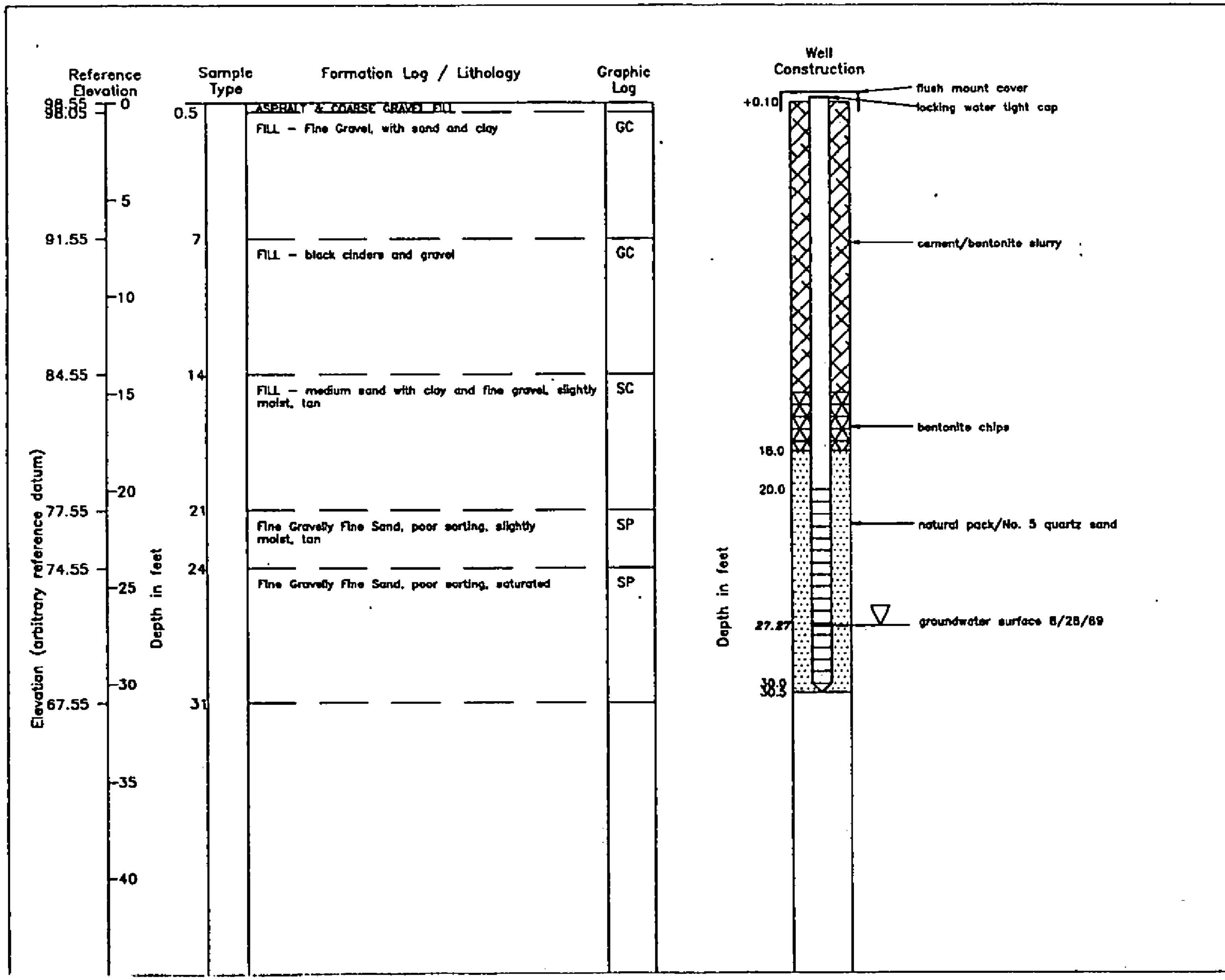

KECK CONSULTING SERVICES, INC.
WELL INSTALLATION INFORMATION

Well Number: MW-3 Total Depth: 30.44 Feet Below Top of Casing

KCS Representative: Tim Hebert

Started: 8/28/89 Completed: 8/28/89

Drilling Method: 4 1/4-inch Hollow Stem Auger

Well Cover: Flush Mount Cap: Locking Water Tight

Riser: Diameter: 2.0 inches

Material: PVC

Joints: Machine Flush Threaded

Length: 20.10 Feet

Riser Interval: +0.10' to 20.0'

Screen: Diameter: 2.0 inches

Material: PVC

Type: Machine

Slot: 0.010 inches

Length: 10.0 Ft.

Screened Interval: 20.0 Ft. to 30.0 Ft.

Grout Material: Cement/Bentonite

Quantity: 15 Gallons

Interval: Surface to 15.0 Feet

Seal Material: Bentonite Chips

Quantity: 100 lbs.

Seal Interval: 15.0 Ft. to 18.0 Ft.

Filter Pack Material: Natural Pack/ No. 5 Quartz Sand

Quantity: 500 lbs.

Filter Interval: 18.0 Ft. to 30.5 Ft.

Depth to Groundwater: 27.27 Ft. BTOC

Date: 8/28/89

GROUNDWATER MONITORING
WELL COMPLETION DIAGRAM

TEST BORING	B-3
WELL	MW-3
SHEET 1 of 1	DATE 10/4/89
CLIENT	Dayton Power & Light
LOCATION	Dryden Road
PROJECT	447-2477

HuntTen/KECK

Appendix C

Groundwater Monitoring Well Field Data Sampling Records

Hunter/Keck, Inc.
Groundwater Monitoring Field Data Log Sheet

Client: Dayton Power and Light Company

Project Location: Dryden Road
Dayton, Ohio

Well I.D.: MW-1

Sampler's Name: Andy Granskog

Date Sampled: 9/12/89

Signature:

Total Depth from Top of Casing 33.40 Ft.

Top of Casing Elevation: 97.80 Ft.

I.D. of Casing: 2 inch

Stick Up: - .41 Ft.

TOC Depth to Water: 26.40 Ft.
Method of Measure: Water Level Indicator
Time of Measurement: 11:30 Hr.
Water Height in Well: 7.0 Ft.
Water Volume in Well: 1.17 Gal.

Sampling Method: Bailer

Purging Method Bailer and Keck Pump
Recovery Data:
TOC Depth to Water: Time:
(in centimeters)

Sample#	Time	Volume	Preservative	Analysis
MW1	1350	VOA	Refrig	Blank
MW1	1350	VOA	Refrig	Blank
MW1	1355	VOA	Refrig	BTEX
MW1	1355	VOA	Refrig	BTEX
MW1	1355	VOA	Refrig	BTEX
MW1	1405	VOA	Refrig	Lead
MW1	1405	VOA	Refrig	Lead
MW1	1400	1000 ml	Refrig	TPH

	Temp (C)	pH	Cond. umho/cm	Volume Water Purged
1.	19.5	7.01	1.4	70 gal
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Physical Properties:

Free Product: None

Odor: None Color: Brown

Turbidity:

Observations: Good recharge, but didn't clear well. Developed 70 gallons.

Hunter/Keck, Inc.
Groundwater Monitoring Field Data Log Sheet

Client: Dayton Power and Light Company

Project Location: Dryden Road
Dayton, Ohio

Well I.D.: MW-2

Sampler's Name: Andy Granskog

Date Sampled: 9/12/89

Signature:

Total Depth from Top of Casing 34.04 Ft.

Top of Casing Elevation: 97.86 Ft.

I.D. of Casing: 2 inch

Stick Up: - .33 Ft.

TOC Depth to Water: 26.58 Ft.
Method of Measure: Water Level Indicator
Time of Measurement: 11:40 Hr.
Water Height in Well: 7.46 Ft.
Water Volume in Well: 1.24 Gal.

Sampling Method: Teflon Bailer

Purging Method Bailer and Keck Pump
Recovery Data:
TOC Depth to Water: Time:
(in centimeters)

Sample#	Time	Volume	Preservative	Analysis
MW2	1450	VOA	Refrig	Blank
MW2	1450	VOA	Refrig	Blank.
MW2	1520	VOA	Refrig	BTEX
MW2	1520	VOA	Refrig	BTEX
MW2	1520	VOA	Refrig	BTEX
MW2	1520	VOA	Refrig	Lead
MW2	1520	VOA	Refrig	Lead
MW2	1525	1000 ml	Refrig	TPH

	Temp (C)	pH	Cond. umho/cm	Volume Water Purged
1.	21.4	6.96	1.8	100 gal
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Physical Properties:

Free Product: Sheen on water surface

Odor: Slight Color: Brown

Turbidity:

Observations: Good recharge.
Developed 100 gallons.

Hunter/Keck, Inc.
Groundwater Monitoring Field Data Log Sheet

Client: Dayton Power and Light Company

Project Location: Dryden Road
Dayton, Ohio

Well I.D.: MW-3

Sampler's Name: Andy Granskog

Date Sampled: 9/12/89

Signature:

Total Depth from Top of Casing 30.46 Ft.

Top of Casing Elevation: 98.65 Ft.

I.D. of Casing: 2 inch

Stick Up: - .10 Ft.

TOC Depth to Water: 27.27 Ft.
Method of Measure: Water Level Indicator
Time of Measurement: 11:35 Hr.
Water Height in Well: 3.19 Ft.
Water Volume in Well: 0.50 Gal.

Sampling Method: Teflon Bailer

Purging Method Bailer and Keck Pump
Recovery Data:
TOC Depth to Water: Time:
(in centimeters)

Sample#	Time	Volume	Preservative	Analysis
MW3	1535	VOA	Refrig	Blank
MW3	1555	VOA	Refrig	Blank
MW3	1555	VOA	Refrig	BTEX
MW3	1555	VOA	Refrig	BTEX
MW3	1555	VOA	Refrig	BTEX
MW3	1555	VOA	Refrig	Lead
MW3	1555	VOA	Refrig	Lead
MW3	1555	1000 ml	Refrig	TPH

	Temp (C)	pH	Cond. umho/cm	Volume Water Purged
1.	20.2	7.04	1.6	2.5 gal
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Physical Properties:

Free Product: None

Odor: None Color: Brown

Turbidity:

Observations: Slow recharge.
Bailed dry 5 times.

Appendix D

Laboratory Reports
Chain-of-Custody Record

Chemrox Laboratory Services

217 Long Hill Crossroads   Shelton, CT 06484   Phone 203 926-9081   Fax 203 926-9334

September 29, 1989

Report #A247
Hunter/Keck
521 Byers Road/Suite 101
Miamisburg, OH 45342

Attention: Dave Kearns

Purpose and Methodology:

Six samples, Project Number: 447-3600, were submitted to Chemrox Laboratory Services. The client requested the following analyses:

- BTEX
- Dissolved Lead
- Total Petroleum Hydrocarbons

The volatile organics were analyzed by purge and trap GC in accordance with Method 601/602. The analysis was performed on a Varian 3400 GC system equipped with a Tekmar Model LSC2000 headspace concentrator.

The petroleum hydrocarbons were extracted in accordance with EPA Method 9070 and analyzed in accordance with EPA Method 418.1. The analysis was performed on a Perkin Elmer Model 1420 Infrared Spectrophotometer.

The metals were prepared in accordance with EPA Methods 3005 and 3020. The metals were performed using a Perkin Elmer Plasma 40 ICP Spectrometer and a Perkin Elmer Zeeman 5100 Atomic Absorption Spectrophotometer equipped with a Perkin Elmer HGA 600 graphite furnace.

The results of the analysis are presented in the following tables.

Prepared by:

Peter W. Georges

Peter W. Georges
QA/QC Officer

chemrox

ANALYSIS RESULTS

Company Hunter/Keck

Job Number A247

Analysis Lead

Date Received 09/15/89

Date Extracted 09/19/89

Date Analyzed 09/26/89

Matrix Liquid

Units ppm

Analyst M. Withrow

SAMPLE DI	PARAMETER
	LEAD
891291 MW1	< 0.006
891292 MW2	0.010
891293 MW3	0.018

Chemrox Laboratory Services
Connecticut Certification #PH-0559

BTEX ANALYSIS BY GC

Client Hunter/Keck

Date Received 09/15/89

Matrix Water

Job Number A247

Date Analyzed 09/27/89

Units µg/L (ppb)

Method Purge and Trap GC

Analyst C. Spiteri

DLM	1	1	METHOD DETECTION LIMIT
COMPOUND	BLANK	891296 MW3 3:35	
Benzene	U	U	2
Ethylbenzene	U	U	5
Toluene	U	5.0	5
Totalxylene	U	12	5

U = Undetected

Chemrox Laboratory Services
Connecticut Certification #PH-0559

BTEX ANALYSIS BY GC

Client Hunter/Keck

Job Number A247

Method Purge and Trap GC

Date Received 09/15/89

Date Analyzed 09/23/89

Matrix Water

Units µg/L (ppb)

Analyst C. Spiteri

DLM	1	20	50	1	1	1	
COMPOUND	BLANK	891291 MW1	891292 MW2	891293 MW3	891294 MW1 1:50	891295 MW2 2:50	METHOD DETECTION LIMIT
Benzene	U	U	3,700	U	U	U	2
Ethylbenzene	U	2,900	6,100	U	U	U	5
Toluene	U	U	11,000	U	U	U	5
Totalxylene	U	1,100	7,500	U	U	9.8	5

U = Undetected

Chemrox Laboratory Services
Connecticut Certification #PH-0559

ANALYSIS RESULTS

Company Hunter/Keck
Job Number A247
Analysis TPHC

Date Received 09/15/89
Date Extracted 09/15/89
Date Analyzed 09/18/89

Matrix Liquid
Units mg/L (ppm)
Analyst J. Shamas

SAMPLE DI	PARAMETER
	TPHC
891291 MW1	36
891292 MW2	58
891293 MW3	< 1

Chemrox Laboratory Services
Connecticut Certification #PH-0559

QUALITY CONTROL SUMMARY

Company Hunter/Keck Job Number A247 Analyst M. Withrow

PARAMETER	RELATIVE PERCENT DIFFERENCE	SPIKE RECOVERY %
Lead	U	102

Chemrox Laboratory Services
Connecticut Certification #PH-0559

HUNTER/KECK

OFFICE ADDRESS:
521 Byers Rd
Suite 101
Miamisburg OH 45342

CHAIN-OF CUSTODY RECORD

2104

PROJECT LOCATION	NAME OF CLIENT	PROJECT TELEPHONE NO.	PROJECT NUMBER
Dayton OH	Dryden Rd DP+L	(513) 859-3600	447-2477

ITEM NO.	SAMPLE NO.	TIME	NO. OF CONTAINERS	SAMPLE TYPE		SAMPLE DESCRIPTION	TRANSFER NO. & CHECK 1	2	3	4	5
1	MW 1	1:50p	2	VOAs	9/12/89	Pre MW-1 Bailer Blank					
2	MW 1	1:55p	3	VOAs	9/12/89	MW-1 BTEX					
3	MW 1	2:05p	2	VOAs	9/12/89	MW-1 Diss Lead					
4	MW 1	2:00p	1	1000ml	9/12/89	MW-1 TPH					
5	MW2	2:50p	2	VOAs	9/12/89	Pre MW-2 Bailer Blank					
6	MW2	3:20p	3	VOAs	9/12/89	~~MW~~ MW-2 BTEX					
7	MW2	3:20p	2	VOAs	9/12/89	MW-2 lead					
8	MW2	3:25p	1	1000ml	9/12/89	MW-2 TPH					
9	MW3	3:35p	2	VOAs	9/12/89	Pre MW-3 Bailer Blank					
10	MW3	3:55p	3	VOAs	9/12/89	MW-3 BTEX					

PERSON RESPONSIBLE FOR SAMPLE COLLECTION	DATE	AFFILIATION
Andy Granskog	9/12/89	HKI

PURPOSE OF ANALYSIS (use back of front sheet if needed)

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	10	Andrew Granskog	Storage HKI	9/12/89	
2	10	M. Cartwright	FED X	9/14/89	1126
3					
4					
5					

WHITE—Project Manager YELLOW—Geologist GOLD—Laboratory Copy

HUNTER/KECK

OFFICE ADDRESS:
521 Byers Rd
Suite 101
Miamisburg OH 45342

CHAIN-OF CUSTODY RECORD

LABORATORY ADDRESS:

2105

PROJECT LOCATION	NAME OF CLIENT	PROJECT TELEPHONE NO.	PROJECT NUMBER
Dayton OH	Dryden Rd DP&L	(513) 859-3600	447-2477

ITEM NO.	SAMPLE NO.	TIME	NO. OF CONTAINERS	SAMPLE TYPE						SAMPLE DESCRIPTION	TRANSFER NO. & CHECK 1	2	3	4	5
1	MW3	3:55p	2	VOAs	9/12/89					MW-3 lead					
2	MW3	3:55p	1	1000ml	9/12/89					MW-3 TPH					
3															
4															
5															
6															
7															
8															
9															
10															

PERSON RESPONSIBLE FOR SAMPLE COLLECTION: Andy Granstog — DATE: 9/12/89 — AFFILIATION: HKI

PURPOSE OF ANALYSIS (use back of front sheet if needed)

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
1	2	Andrew Granstog	storage HKI	9/12/89	9[illegible]
2	2	M. Cartwright	FED X	9/14/89	1126
3					
4					
5					

WHITE—Project Manager YELLOW—Geologist GOLD—Laboratory Copy

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Appendix E

Water Well Logs

ORIGINAL

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

Dayton

No. 155861

County Montgomery Township Mad River Section of Township or Lot Number [illegible]

Owner Dayton Steel Foundry Co Address Miami Chappel Road

Location of property Plant site above

CONSTRUCTION DETAILS

Casing diameter 12 Length of casing

Type of screen Johnson Length of screen 25

Type of pump D.W. Turbine

Capacity of pump 600 G.P.M.

Depth of pump setting 90'

PUMPING TEST

Pumping rate 1000 G.P.M. Duration of test 8 h

Drawdown 20 ft. Date 8/15/55

Developed capacity Above

Static level—depth to water 45

Pump installed by US

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
	0 Feet	Ft.
Note this well made thru bottom of existing 18" well 62' deep		
Gravel- Clay balls	62	68
Gravel	68	74
Clay & gravel	74	83
Clay	83	98
Gravel	98	140

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

W.

S.

See reverse side for instructions

Drilling Firm W. M. Boger & Son Date 8/20/55

Address Cols. Ohio Signed W. H. Boger

(1) 1.

ORIGINAL

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

No. 147466

County Montgomery Township Moraine Section of Township or Lot Number Southwest

Owner the Dayton Power & Light Address 25 North Main St. Dayton

Location of property 500 Yds South of Miami River on S. Broadway

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 70'

Type of screen ________ Length of screen ________

Type of pump 5 H.P. Turbine

Capacity of pump 4000 gal per hr.

Depth of pump setting 62'

PUMPING TEST

Pumping rate 20 G.P.M. Duration of test 8

Drawdown 50 ft. Date May 27-55

Developed capacity ________

Static level—depth to water 35

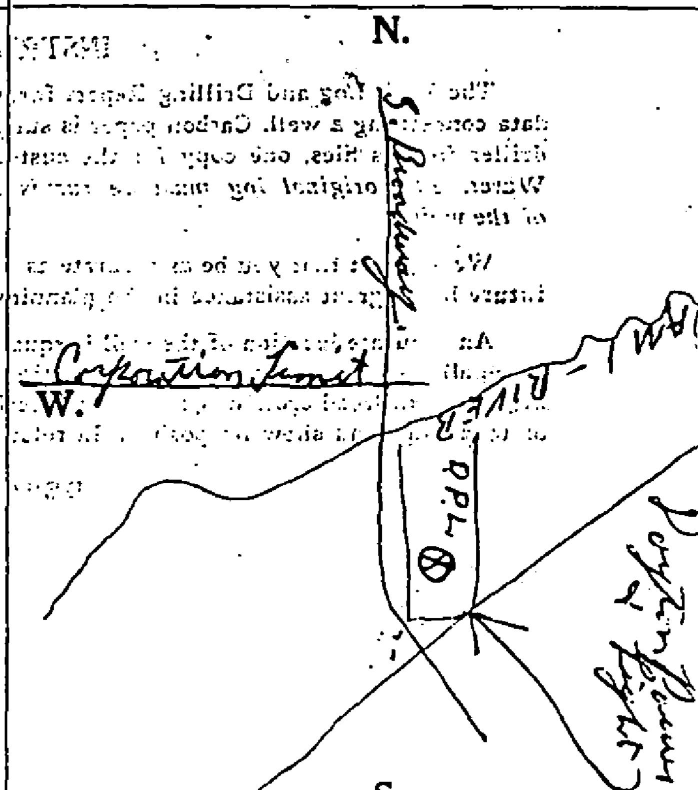
Pump installed by B.B. Dillman & Co.

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
fill	0 Feet	27 Ft.
dry Gravel	27	41
Hard pan	41	47
Clay + Gravel	47	56
water sand + Gravel	56	70

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm M. U. Scott

Address 5854 Bradford Rd Dayton O.

Date May 27-55

Signed M. U. Scott

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x-1516[illegible]
[illegible]
y-623[illegible]

ORIGINA

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

No. 136475

County Mont Township Moraine Section of Township or Lot Number 14

Owner Dayton Power + Light Address 25 North Main Dayton

Location of property Springboro Pike (State Rt 25) 1 Mile West

CONSTRUCTION DETAILS		PUMPING TEST	
Casing diameter 5 5/8	Length of casing 78	Pumping rate .... G.P.M.	Duration of test .... h
Type of screen	Length of screen	Drawdown .... ft.	Date
Type of pump		Developed capacity	
Capacity of pump		Static level—depth to water 37'	
Depth of pump setting		Pump installed by	

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay + Gravel	0 Feet	15 Ft.
Clay	15	47
Sand	47	76
Gravel	76	78
Water @ 47'		

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

W. Spring[illegible] Road

Rt. 25

S.

See reverse side for instructions

Drilling Firm Elbert Hay Date 9/17/54

Address 2900 [illegible] Signed Elbert Hay

(2)

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ORIGINAL

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

Moraine

No. 179361

County Montgomery Township — Section of Township

Owner Dayton Power Light Address Tait Station Dayton O

Location of property Tait Station Dayton, Ohio Corner of East River & Dryden Rd.

CONSTRUCTION DETAILS		BAILING OR PUMPING TEST	
Casing diameter 20"	Length of casing 101	Pumping rate 3000 G.P.M.	Duration of test 8 hrs
Type of screen Red Brass	Length of screen 50'	Drawdown 23' ft.	Date 3/5/56
Type of pump —		Developed capacity 3000 gpm	
Capacity of pump —		Static level—depth to water 23' ft	
Depth of pump setting —		Pump installed by —	
Date of completion —			

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Topsoil	0 Feet	10 Ft.
Gravel	10	30
Till	30	40
Gravel	40	63
Sand	63	70
Gravel	70	83
Gravel	83	92
Gravel	92	155

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

W. E

S.

See reverse side for instructions

Drilling Firm Donald J Roe Date 3/5/56

Address Vandalia, Ohio Signed Don Roe

(2)

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WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1500 Dublin Road
Columbus, Ohio

Moraine

No. 179363

County Montgomery Township ~~[illegible]~~ Section of Township

Owner Dayton Power & Light Address [illegible] Bldg, Dayton Ohio

Location of property Intersection of East River Rd & Springboro Pike North East Corner

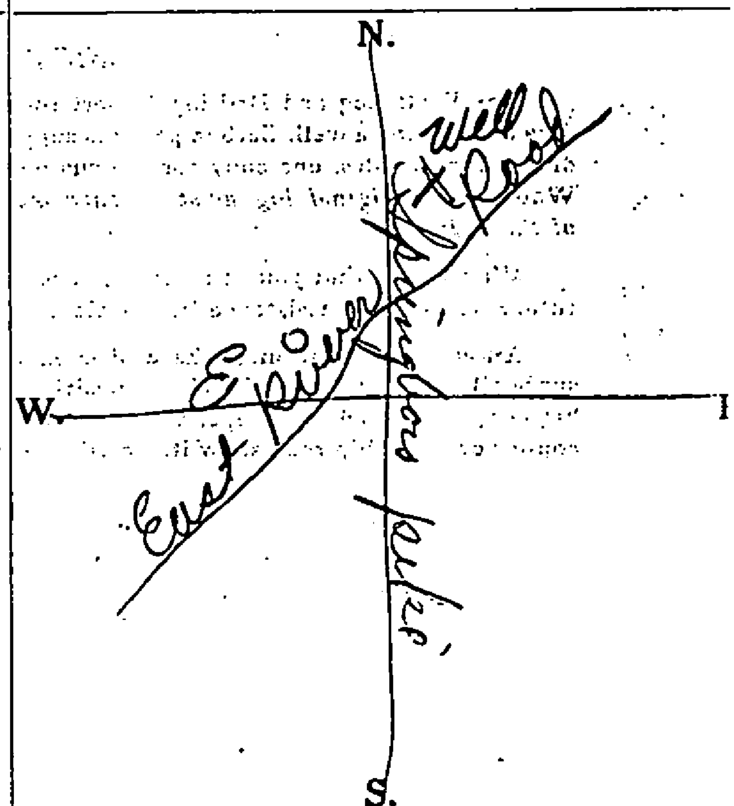
CONSTRUCTION DETAILS		BAILING OR PUMPING TEST	
Casing diameter 14"	Length of casing 108'	Pumping rate 1000 G.P.M.	Duration of test 8 hr.
Type of screen Red Brass	Length of screen 30'	Drawdown 70 ft.	Date July 20, 1956
Type of pump —		Developed capacity 1000 gpm	
Capacity of pump —		Static level—depth to water 30' ft.	
Depth of pump setting —		Pump installed by	
Date of completion —			

WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Fill	0 Feet	18 Ft.
Gravel	18	33
Gravel	33	57
Gravel	57	62
Gravel	62	78
Till	78	104
Gravel	104	140
Till	140	143

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Donald J. Rae Date July 20, 1956

Address Vandalia, Ohio Signed Don Rae

(2)

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WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio 43212

PLEASE USE PENCIL OR TYPEWRITER

DO NOT USE INK.

No. 342961

Moraine

County Montgomery Township [illegible] Section of Township

Owner The Dayton Power & Light Co. Address 25 N. Main St. Dayton

Location of property Test Station - Between Plant & Railroad off Carillon Blvd. S of Dayt

CONSTRUCTION DETAILS

Casing diameter 20" O.D. Length of casing 168 ft.

Type of screen Red Brass Length of screen 65 ft.

Type of pump

Capacity of pump

Depth of pump setting

Date of completion

BAILING OR PUMPING TEST

Pumping Rate 3010 G.P.M. Duration of test 8 hr

Drawdown 17 ft. Date 4-1-66

Static level-depth to water 47 ft

Quality (clear, cloudy, taste, odor) Clear

Pump installed by

WELL LOG*

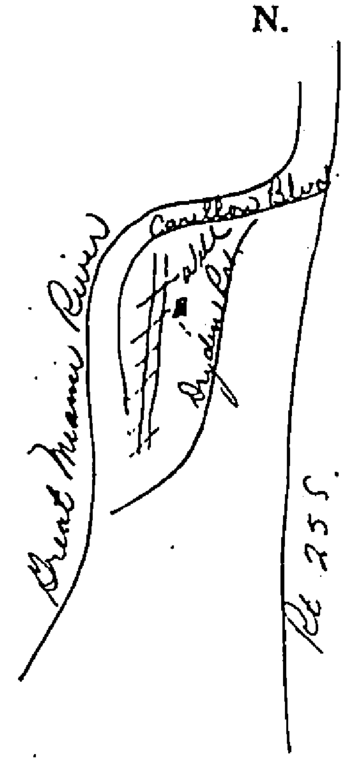
Formations Sandstone, shale, limestone, gravel and clay	From	To
Fill	0 Feet	3 Ft.
Dry gravel	3	40
Large wet gravel	40	60
Coarse gravel	60	65
Coarse sand & coarse gravel	65	70
Dirty sand & gravel	70	75
Dirty large gravel	75	80
Cemented gravel - water bearing	80	126
Coarse sand & coarse gravel	126	140
Cemented gravel	140	165
Medium sand	165	168
Clay	168	170

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.

N.

W.



E.

S.

See reverse side for instructions

Drilling Firm Moody's of Dayton, Inc.

Address P.O. Box 157, Vandalia, Ohio

Date April 7th 1966

Signed Ed B. Wagner - President

*If additional space is needed to complete well log, use next consecutive numbered form

WELL LOG AND DRILLING REPORT

State of Ohio

DEPARTMENT OF NATURAL RESOURCES

Division of Water

1562 W. First Avenue

Columbus, Ohio 43212

ORIGINAL

No. 342985

PLEASE USE PENCIL OR TYPEWRITER

DO NOT USE INK.

County Montgomery Township ~~Miami~~ Moraine Section of Township

Owner Dayton Power & Light Co. Address Dayton, Ohio

Location of property Tait Station - Well #4

CONSTRUCTION DETAILS

Casing diameter 20" Length of casing 148'

Type of screen Red Brass Length of screen 50'

Type of pump Turbine

Capacity of pump 1000 G.P.M.

Depth of pump setting 147'

Date of completion June 7, 1967

BAILING OR PUMPING TEST

Pumping Rate 1000 G.P.M. Duration of test 8 hrs.

Drawdown 8 ft. Date 7/8/67

Static level-depth to water 50 ft.

Quality (clear, cloudy, taste, odor) Clear

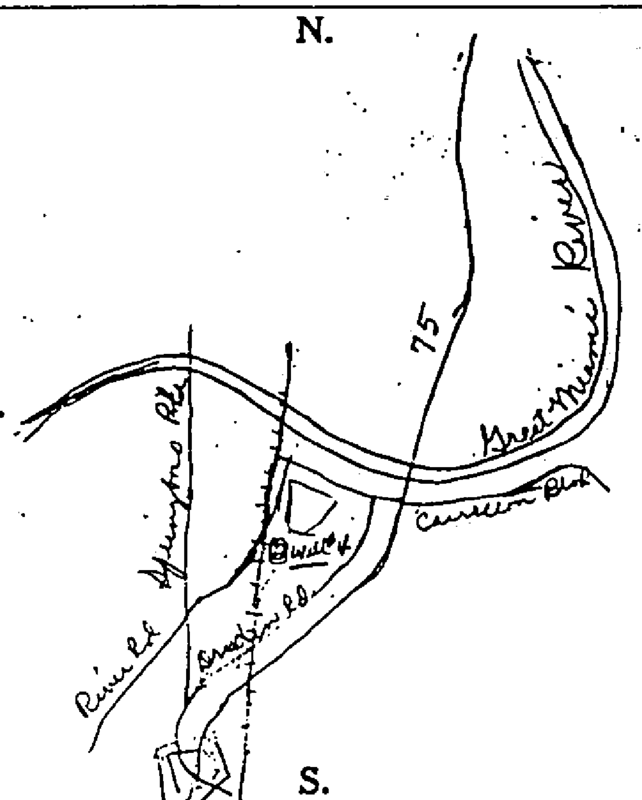
Pump installed by C. O. Burgess

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
Road Bed & Fill	0 Feet	2 Ft.
Till	2	8
Dry Sand & Gravel	8	15
Coarse Sand & Gravel	15	25
Sand, Gravel & Boulders	25	35
Coarse sand & Coarse gravel	35	57
Till	57	66
Dty Coarse sand, gravel & bldrs	66	79
Good Coarse sand & gravel	79	100
" " " " "	100	115
Med. sand & Med. Gravel	115	126
" " & fine "	126	130
Fine sand & Med. "	130	140

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Moody's of Dayton, Inc. Date November 13, 1967

Address P.O. Box 155, Vandalia, Ohio 45377 Signed V. C. Casper

*If additional space is needed to complete well log, use next consecutive numbered form.

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ORIGI

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1562 W. First Avenue
Columbus, Ohio ~~43212~~

Page 2

No. 342986

PLEASE USE PENCIL OR TYPEWRITER

DO NOT USE INK.

County Montgomery Township ~~[illegible]~~, Moraine Section of Township

Owner Dayton Power & Light Co. Address Dayton, Ohio

Location of property Tait Station - Well #4

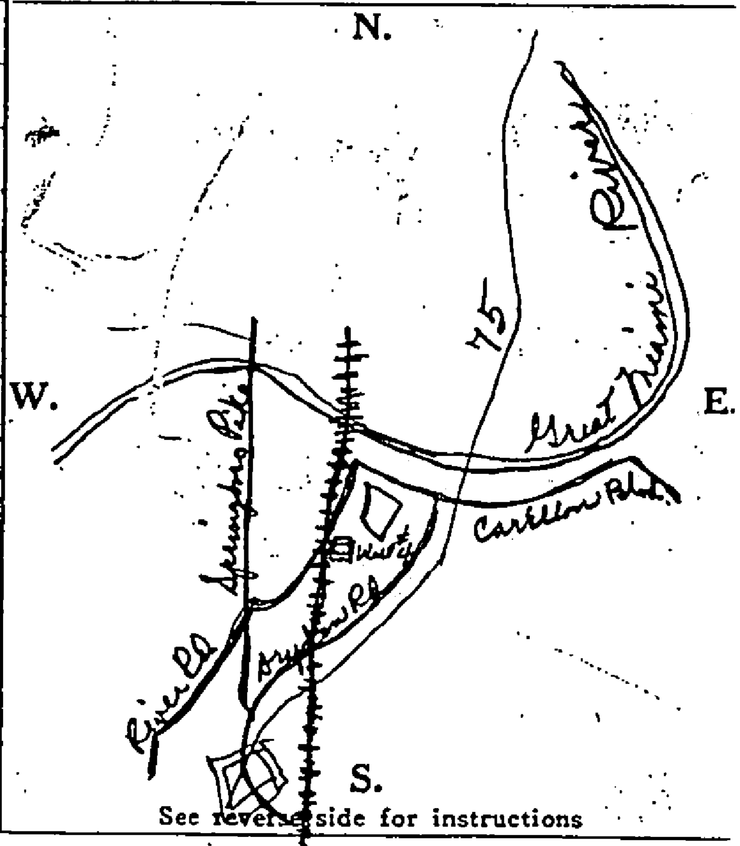
CONSTRUCTION DETAILS	BAILING OR PUMPING TEST
Casing diameter 20" Length of casing 148'	Pumping Rate 1000 G.P.M. Duration of test 8 hr
Type of screen Red Brass Length of screen 50'	Drawdown 8 ft. Date 7/8/67
Type of pump Turbine	Static level-depth to water 50 ft
Capacity of pump 1000 G.P.M.	Quality (clear, cloudy, taste, odor) Clear
Depth of pump setting 147'	
Date of completion June, 1967	Pump installed by

WELL LOG*

Formations Sandstone, shale, limestone, gravel and clay	From	To
(Continued)	0 Feet	Ft.
Fine sand & Coarse gravel	140	144
Blue Clay	144	146
Good Med. sand & Coarse gravel	146	156
" " " " "	156	165
Yellow Clay	165	167
Coarse sand & Crse gravel (slightly dirty)	167	178
Coarse sand & Coarse gravel	178	198
Clay	198	200

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Moody's of Dayton

Address P.O. Box 155, Vandalia, Ohio 45377

Date November 13, 1967

Signed V. C. Casper

*If additional space is needed to complete well log, use next consecutive numbered form

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WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

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499062

COUNTY Montgomery TOWNSHIP Moraine SECTION OF TOWNSHIP

OWNER Rack Processing Co. ADDRESS 2350 Dryden Rd

LOCATION OF PROPERTY Dayton Ohio 45439

CONSTRUCTION DETAILS	
Casing diameter 5 5/8	Length of casing 130
Type of screen	Length of screen
Type of pump	
Capacity of pump	
Depth of pump setting	
Date of completion	

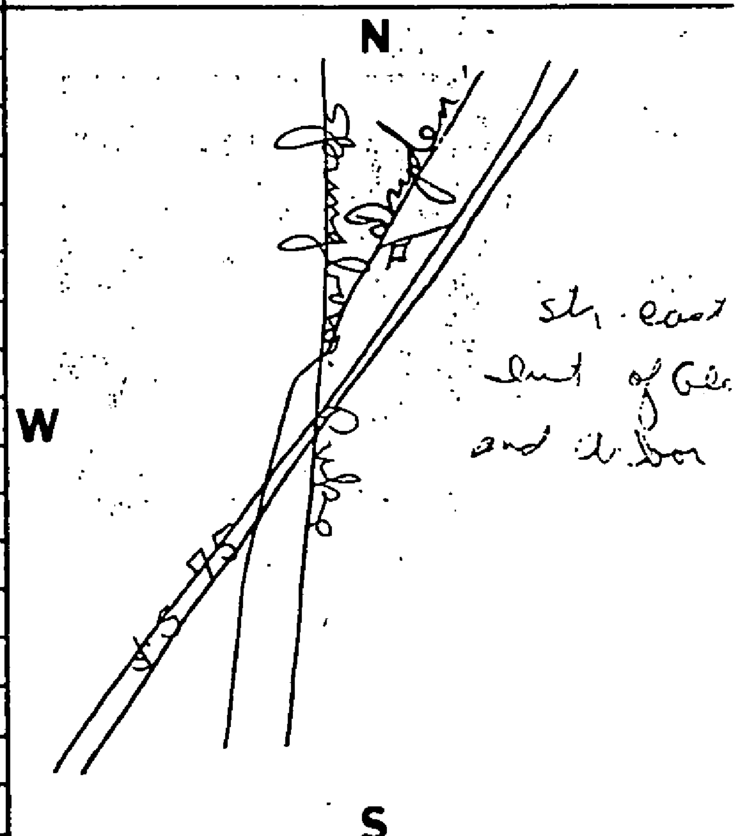
BAILING OR PUMPING TEST (specify one by circling)	
Test rate 30 gpm	Duration of test 2
Drawdown 20 ft	Date May
Static level (depth to water) 65	
Quality (clear, cloudy, taste, odor)	
Pump installed by	

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Clay	0 ft	15 ft
dry gravel	15	85
water bearing gravel	85	130

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.



5th east
Out of Ger.
and W. Dor

DRILLING FIRM CLAY P. GARRISON
WELL CONTRACTOR

ADDRESS 3901 S. DIXIE DRIVE
DAYTON, OHIO 45439

DATE May 9 76

SIGNED Clay P. Garrison

*If additional space is needed to complete well log, use next consecutive numbered form.

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A2 ✓

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Geological Survey
Fountain Square
Columbus, Ohio 43224 Phone (614) 466-5344

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493091

COUNTY Montgomery TOWNSHIP Mission SECTION OF TOWNSHIP OR LOT NUMBER

OWNER Steve Tomsky ADDRESS 3853 Old Springfield Road

LOCATION OF PROPERTY Dwyden Road Longstreth 60

CONSTRUCTION DETAILS

Casing diameter 5 5/8 Length of casing 115

Type of screen ___ Length of screen ___

Type of pump ___

Capacity of pump ___

Depth of pump setting ___

Date of completion ___

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 30 gpm Duration of test 2 h

Drawdown 20 ft Date Feb 28 7

Static level (depth to water) 70

Quality (clear, cloudy, taste, odor)

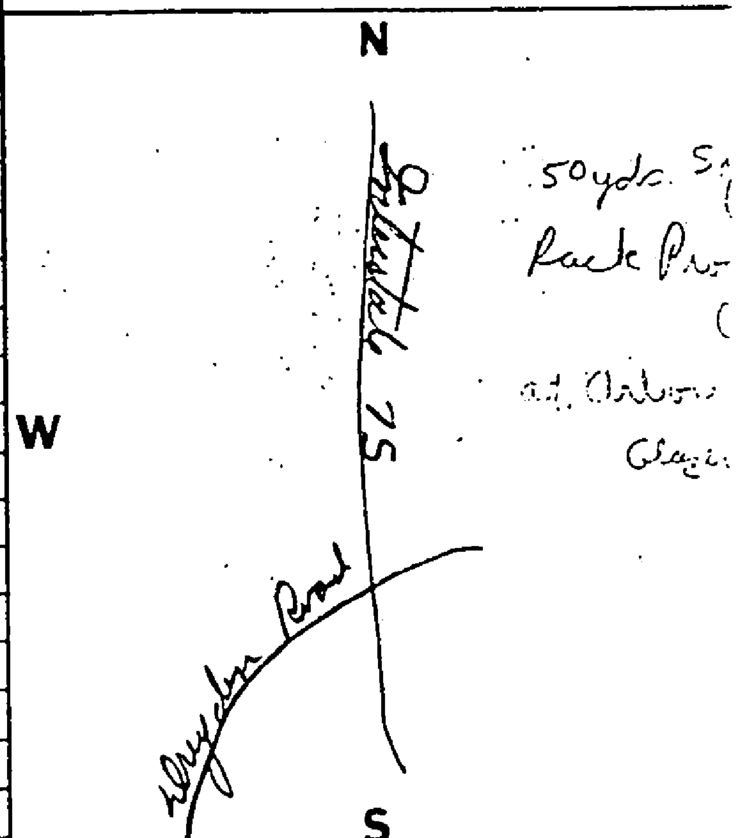
Pump installed by ___

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Clay	0 ft	10 ft
Clay gravel	10	101
Water Bearing gravel	101	115

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.



DRILLING FIRM CLAY P. GARRISON

ADDRESS WELL CONTRACTOR
3901 S. DIXIE DRIVE
DAYTON, OHIO 45439

DATE Feb 28 76

SIGNED Clay P Garrison

*If additional space is needed to complete well log, use next consecutive numbered form.

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County Permit No.

WELL LOG AND DRILLING REPORT

ORIGINAL

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

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COUNTY Montgomery TOWNSHIP Moraine SECTION OF TOWNSHIP

OWNER MOSIER TREE COMPANY ADDRESS 3910 Rexford Road - Dayton, Ohio 45430

LOCATION OF PROPERTY 2370 Dryden Road - Dayton, Ohio 45439

CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 128

Type of screen 0 Length of screen

Type of pump Submergible

Capacity of pump 600 G.P.H.

Depth of pump setting 115

Date of completion June 26, 1980

BAILING OR PUMPING TEST
(specify one by circling)

Test rate 20 gpm Duration of test hrs

Drawdown 4 ft Date June 26, 1980

Static level (depth to water) 45 ft

Quality (clear, cloudy, taste, odor) Clear

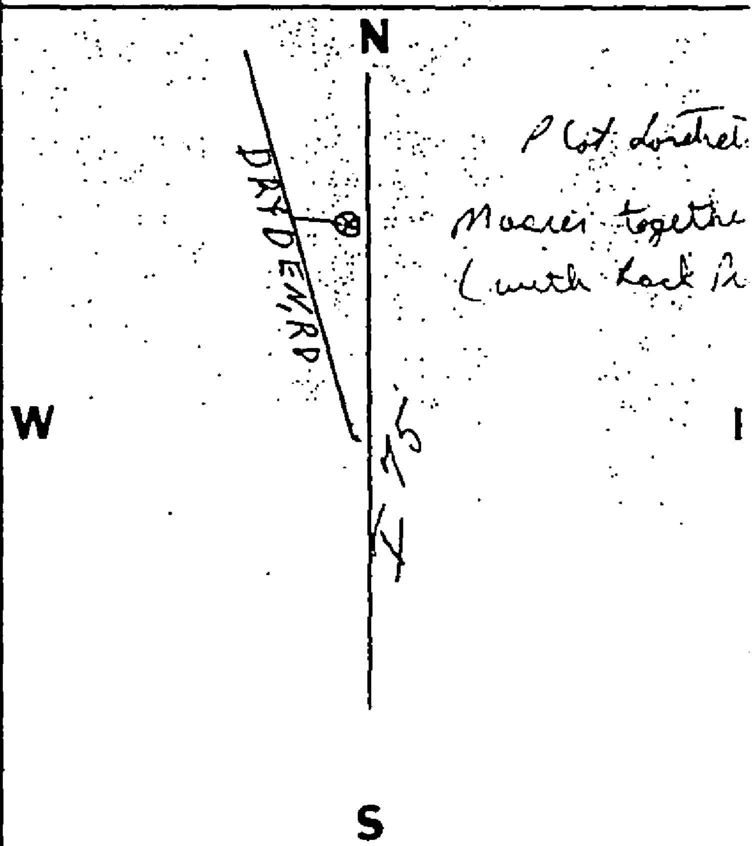
Pump installed by W.U. SCOTT COMPANY

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Yellow Clay	0 ft	7 ft
Dry Gravel	7	66
Water Gravel	66	128

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.



DRILLING FIRM W.U. SCOTT COMPANY DATE June 26, 1980

ADDRESS 11534 Peters Pike SIGNED W. U. Scott

Tipp City, Ohio 45371

*If additional space is needed to complete well log, use next consecutive numbered form.

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ORIGINAL

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Columbus, Ohio

No. 158881

County Montgomery Township ~~Miami~~ Moraine Section of Township or ~~Lot Number~~ Northwest

Owner Moraine Corp Address Dayton

Location of property 900 SW from South Broadway on 2330 E River Rd

CONSTRUCTION DETAILS		PUMPING TEST	
Casing diameter	5 5/8"	Bailing ~~Pumping~~ rate	25 G.P.M.
Length of casing	70	Duration of test	1 hr
Type of screen		Drawdown	0 ft.
Length of screen		Date	8/10/57
Type of pump		Developed capacity	25 GPM
Capacity of pump		Static level—depth to water	24
Depth of pump setting		Pump installed by	—

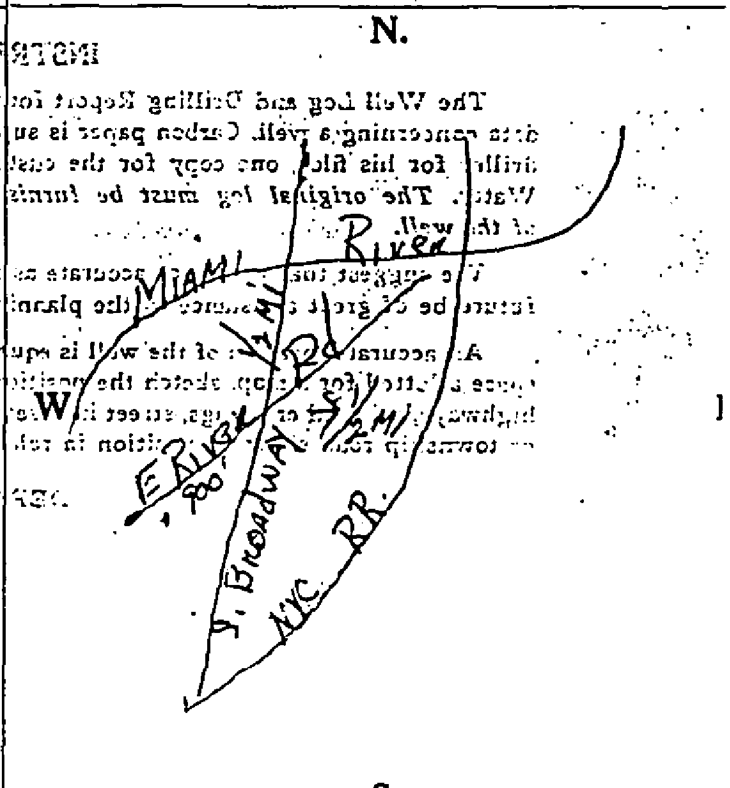
WELL LOG

Formations Sandstone, shale, limestone, gravel and clay	From	To
Clay	0 Feet	4 Ft.
Gravel & Clay	4	30
Water gravel	30	55
Sand & Clay	55	57
Water gravel	57	70

Water at 30'

SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.



See reverse side for instructions

Drilling Firm Lewis C Harman Date 8/30/57

Address 804 Soldiers Home West Carrollton Rd. Signed Lewis C. Harman

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ORIGINAL

(3)

County Permit No.

WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

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MR ✓

COUNTY Montgomery TOWNSHIP Dayton SECTION OF TOWNSHIP 5

OWNER Monsanto Research Co ADDRESS 1515 Nickliss Rd

LOCATION OF PROPERTY Same Dayton, Ohio

CONSTRUCTION DETAILS

- Casing diameter: 5 5/8
- Length of casing: 100
- Type of screen:
- Length of screen:
- Type of pump:
- Capacity of pump:
- Depth of pump setting:
- Date of completion:

BAILING OR PUMPING TEST

(specify one by circling)

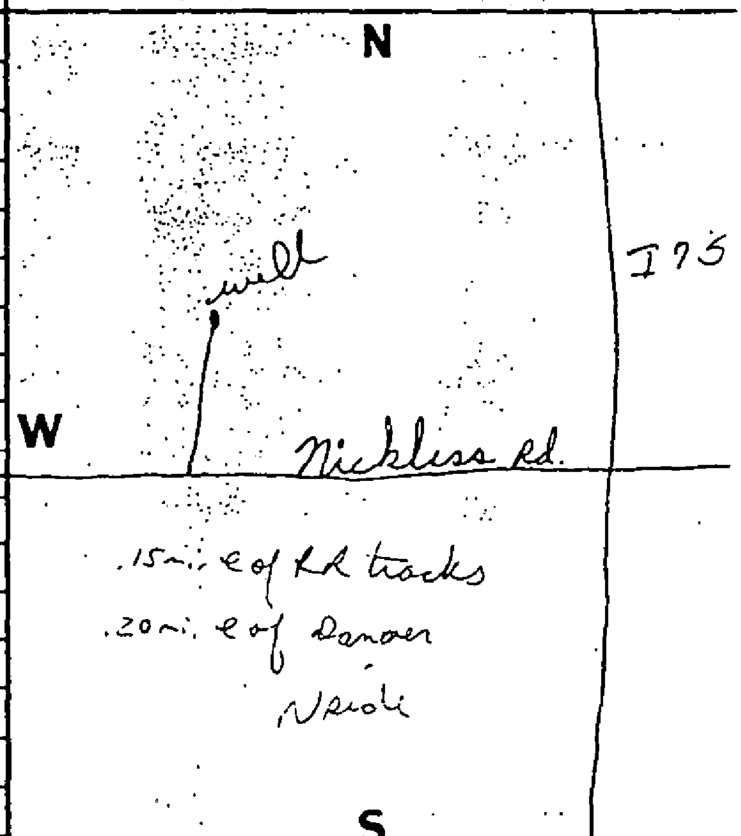
- Test rate: 15+ gpm
- Duration of test: 2 h
- Drawdown: 25 ft
- Date: July 26, 19
- Static level (depth to water): 40
- Quality (clear, cloudy, taste, odor): clear
- Pump installed by:

WELL LOG*

Formations: sandstone, shale, limestone, gravel, clay	From	To
Clay	0 ft	45 ft
Sand Gravel	45	70
Clay	70	80
Gravel	80	100

SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.



DRILLING FIRM Ronald Burchfield

ADDRESS 3901 S Dixie Dayton

DATE July 26, 1979

SIGNED Ronald Burchfield

Clay Garrison (7)

*If additional space is needed to complete well log, use next consecutive numbered form.

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LJB engineers architects

APPENDIX D

Corrective Action Plan

CORRECTIVE ACTION PLAN
DAYTON POWER & LIGHT COMPANY

TRANSPORTATION CENTER
1900 DRYDEN ROAD
DAYTON, OHIO

Submitted To:

Dayton Power & Light Company
1900 Dryden Road
Dayton, Ohio 45402
(513) 227-2565

Submitted By:

SCS Engineers
211 Grandview Drive
Covington, Kentucky 41017
(606) 341-5353

October 1990
File No. 0590005

TABLE OF CONTENTS

LIST OF EXHIBITS

CORRECTIVE ACTION PLAN FOR THE DAYTON POWER & LIGHT PROPERTY
LOCATED AT 1900 DRYDEN ROAD, DAYTON, OHIO

INTRODUCTION

In April 1990, the Dayton Power & Light Company (DP&L) retained SCS Engineers to assemble a corrective action plan for their transportation center located at 1900 Dryden Road in Dayton, Ohio. During the closure of two 10,000 gallon underground storage tanks (UST's), a release of gasoline was detected. In November 1989, a Phase II site investigation was completed. Further contamination assessment work and a corrective action plan was started in April 1990.

The goals of the assessment were to identify the presence of contaminants in the subsurface soils and ground water beneath the property, and to further define the lateral and vertical extent of these contaminants. The corrective action plan will also determine those remedial measures that are warranted to protect human health and the environment.

The extent of contamination assessment was completed in two steps. A Phase II site investigation was performed by Hunter/Keck Inc. in November 1989. The site assessment identified very limited soil contamination beyond the UST cavity and also confirmed the presence of petroleum hydrocarbon in the shallow ground water beneath the site. Additional soil and ground water sampling and analyses were performed to further delineate contamination prior to completing the corrective action plan. This corrective action plan is intended to serve as a summary of the information generated during the field investigations and address the issue of corrective actions at the site as warranted.

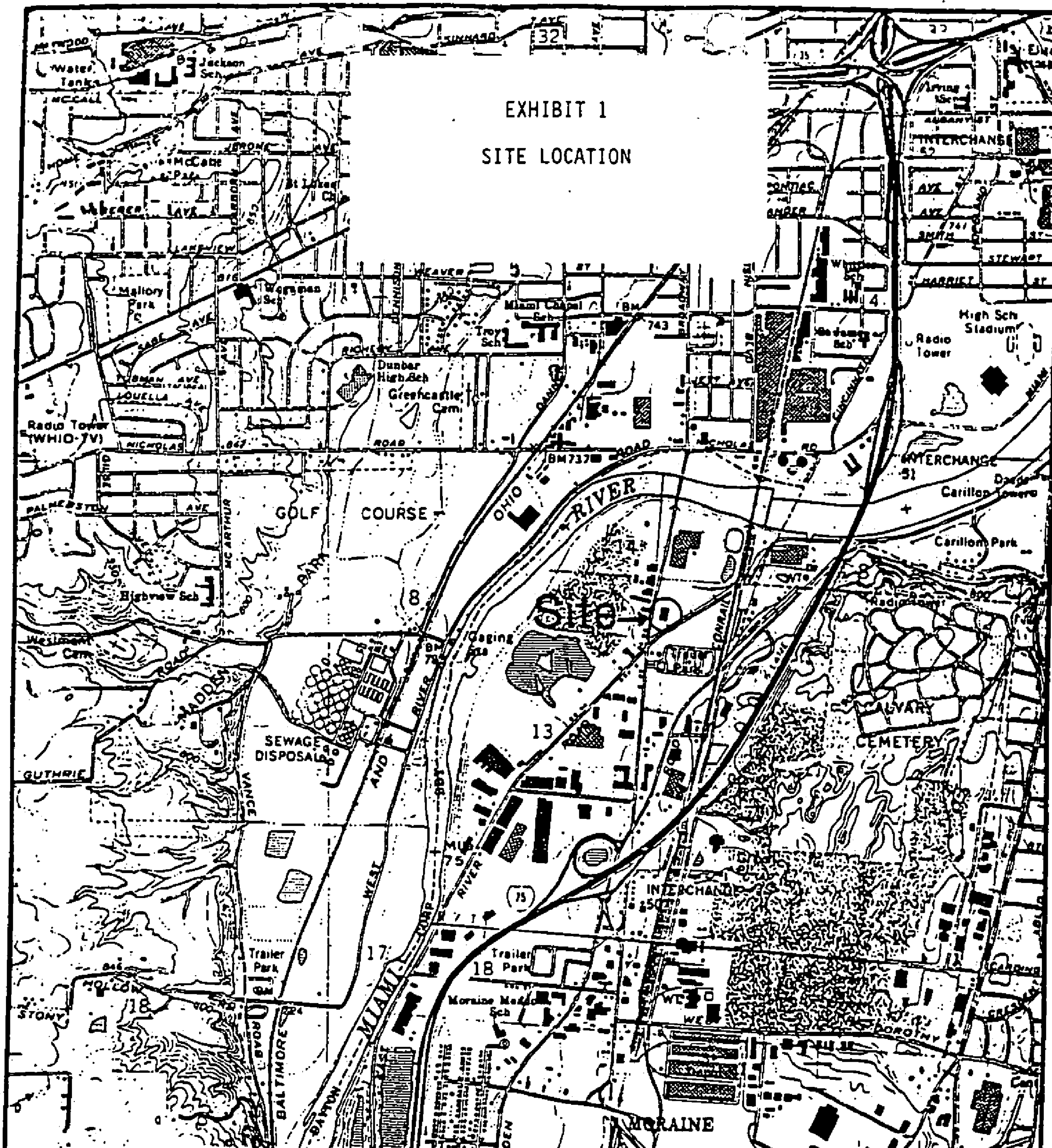
BACKGROUND

The DP&L facility is located approximately 0.8 miles north of the intersection of Interstate 75 and Dryden Road in Dayton, Ohio. The site location is shown in Exhibit 1. The site consists of approximately 40 acres of land whose primary purpose is to serve as a transportation and maintenance center. Administrative offices are also located at the Dryden Road facility.

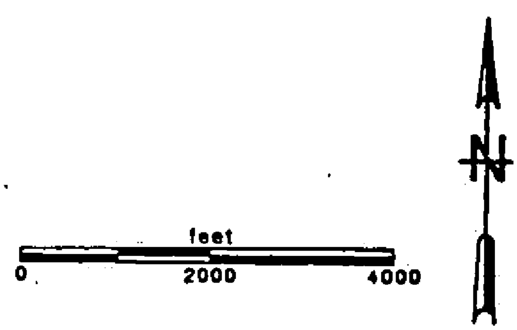
The immediate area surrounding the DP&L facility may be best characterized as commercial/light industrial. Directly north of the site is the Miami River. A Conrail spur is located directly west of the site. A trailer park is located directly south of the facility. Several small commercial facilities are west of the site along Dryden Road.

EXHIBIT 1

SITE LOCATION



Site Location
Dayton Power & Light
Dryden Road
1900 Dryden Road
Moraine Township
Montgomery County
Dayton, Ohio



Adapted from 7.5' USGS topographic quadrangle: Dayton South, 1981.

In April 1989, two 10,000 gallon underground storage tanks were taken out of service. A site layout plan is shown in Exhibit 2. These tanks were used to store gasoline and had been in service for 4 years. Visual inspection of the UST's showed the tanks to be in good shape and free of obvious defects. During the removal of the UST's, a gasoline odor was noted. In order to identify the edge of contamination, the excavation was extended. The final excavation dimensions were approximately 35 ft (east/west) by 50 ft (north/south) by 27 ft deep. Though clean samples were obtained from the north face of the cavity, barriers such as the transportation center, a storm sewer, and ground water caused further enlargement of the tank cavity to be discontinued. Because the extent of contamination was not identified, a site investigation was planned and executed.

The site investigation (SI) was performed between September and November 1989. The SI consisted of drilling four test borings. Three of the four test borings were transformed into ground water monitoring wells. Laboratory analysis of ground water samples showed measurable levels of benzene, toluene, ethyl benzene, and xylene in the ground water. Ground water elevation were also measured as part of the SI.

REGIONAL GEOLOGY AND HYDROGEOLOGY

The geologic setting in the Dayton, Ohio area is primarily buried pre-glacial or inter-glacial river valleys eroded into relatively horizontal sedimentary bedrock strata. During the ensuing glacial stages, these wide, deeply cut valleys were filled with sediments, some to the point of obscurity, which left the terrain with its present appearance. Geologic materials filling the valleys consist principally of sand and gravel outwash deposits and glacial till which occurs as lenses and layers interbedded with the sand and gravel. Glacial till, which was deposited directly by the ice as it moved over the area, is a heterogeneous mixture of clay and stones and lacks assortment or stratification.

Outwash deposits in the Dayton area range in thickness from about 120 to 250 ft. They are the primary source of the large ground water supplies that are pumped for municipal and industrial use. In some parts of the Dayton area, well-defined till sheets, buried by 30 to 60 ft of sand and gravel, extend almost entirely across the major valleys and separate the outwash deposits into two or more distinct aquifers. Being relatively impermeable, till is also a major factor in the hydrologic cycle in the Dayton area as it slows recharge to underlying permeable deposits.

In places, this till-rich zone is made up of well-defined aerially extensive till sheets; elsewhere it consists of numerous lenses and irregular masses of till grouped closely together at approximately the same altitude. In small areas, notably in the Mad River valley immediately below Eastwood Park, the till is either absent from the sand and gravel deposits or consists only of a few scattered lenses.

The upper surface of the till-rich zone lies generally 30 to 50 ft below the land surface in downtown Dayton. The base of the zone, which is much more irregular than the upper surface, ranges from about 60 to 125 ft below land surface. These levels are somewhat arbitrary as the sand and gravel deposits both above and below the till-rich zone contain scattered lenses and masses of till that make it difficult in places to correlate the deposits.

Locally, in the Miami River valley in central and northern Dayton, and more extensively in the Mad River valley downstream from Findlay Street, the till-rich zone consists of two layers, separated by several ft of sand and gravel. The upper till layer generally is thinner and less extensive than the lower till layer. Although locally the intervening sand and gravel constitute a separate aquifer, it is considered part of the upper aquifer.

The bedrock bounding the glacial outwash deposits consists of shale interbedded with thin crystalline layers of limestone. In the upper few ft where this unit was subjected to weathering, fractures and openings along bedding planes are capable of conveying minor amounts of ground water to wells. The remainder of the unit is considered impermeable.

Upland glacial deposits, consisting mostly of till and clay and minor amounts of sand and gravel, overlie the bedrock along the aquifer boundaries or valley walls and provide some recharge to the outwash aquifer. For the most part, however, the upland deposits and the bedrock are less prolific sources of water and used primarily for farm and domestic water supplies.

SPECIFIC SITE CONDITIONS

A total of nine test borings were installed around the maintenance building during the completion of the Phase II investigation (9/89) and the field investigation (5/90). Boring logs from these boreholes indicate that fill material extends to a depth of 15 to 20 ft below grade. The fill material consists of black cinders, foundry sand, and traces of cobbles. Below the fill material, all test borings encountered brown sand with some silt, gravel, and traces of clay. A review of water well records shows that the sand and gravel extends to a depth of approximately 80 ft below grade. This information was obtained from a study of sand and gravel resources of Montgomery County published by the Ohio Department of Natural Resources (ODNR) in 1987. The Phase II investigation identified a discontinuous clay layer which existed at a depth of 40 to 60 ft below grade. However, the ODNR resource shows that this clay barrier was identified between 70 and 80 ft below grade.

A review of ground water wells in the area shows that two larger industrial/municipal wells are located directly west and southwest of the site. These wells are screened in sand and gravel at depth of 25 and 60 ft below grade. During on-site observations, ground water levels were encountered in each test boring between 25 and 27 ft below grade. Ground water elevations were obtained on 5/17/90. The water levels in the monitoring wells (GW-1 through GW-3) were 74.5, 74.4, and 74.5 TBM, respectively. Based on these elevations, ground water direction was calculated to be in the southwest direction. This calculation was made using the three point method.

FIELD INVESTIGATIONS

The field investigations identifying the extent of contamination were divided into two discrete events. A Phase II assessment was performed by Hunter/Keck, Inc. in September 1989. Additional soil borings and ground water monitoring wells were installed as part of the corrective action study in May 1990.

Following the removal of the UST's, Hunter/Keck, Inc. was retained to perform a Phase II assessment. The Phase II assessment consisted of drilling four test borings (B-1 through B-4) around the maintenance garage. The test borings were drilled using a 4-1/4 in. (ID) hollow stem auger drill rig. Soil samples were obtained using 2 in. (ID) split spoon samplers at 5 ft intervals. All boring locations are presented in Exhibit 3. All boring logs are presented in Appendix A. Each soil sample was screened in the field using an HNu photoionization unit. The results of the field screening showed that organic vapors were quantifiable in soil directly above the shallow aquifer. This area is commonly referred to as the capillary zone. In particular, soil samples taken at 34 to 36 ft below grade from MW-1 and MW-3 screened positive for organic vapors.

Test borings B-1, B-3, and B-4 were completed as ground water monitoring wells MW-1, MW-2, and MW-3, respectively. Ground water well locations are shown in Exhibit 4. Ground water well construction diagrams for all ground water wells are presented in Appendix B. Monitoring wells MW-1 and MW-2 were developed using a submersible pump. Monitoring well MW-3 was developed using a hand bailer. The top of well casing elevation and ground surface elevation for each monitoring well was surveyed. An arbitrary reference was used in the absence of a U.S.G.S. benchmark. Depth to ground water was measured in MW-1, MW-2, and MW-3 on September 12, 1989 and ground water elevations were calculated. Based on ground water elevations, ground water flow was in a southwestern direction.

Ground water samples were collected from each of the three monitoring wells. Prior to sample collection, each ground water monitoring well was purged at least three well volumes. Ground water samples were collected using a teflon bailer. All ground water samples were analyzed for total petroleum hydrocarbons, lead, and benzene, toluene, ethyl benzene, and xylene (referred to as BTEX).

As part of the corrective action planning process, the field investigation was expanded in scope to include five additional soil borings. Three of these borings were completed as ground water monitoring wells.

During the week of May 7, 1990, the second phase of the field investigation was performed. The purpose of this phase of the investigation was to delineate and quantify the extent of soil contamination at the site as well as further delineate the extent of ground water contamination.

On May 7 and 8, soil borings GW-1, GW-2, and GW-3 were drilled using a standard 4-1/4 in. (ID) hollow stem auger drill rig. The locations of GW-1, GW-2, and GW-3 are shown in Exhibit 3. Each borehole was drilled to a maximum depth of 31 ft below grade. Soil samples were retrieved using a 2 in. (ID) split spoon sampler advanced ahead of the lead auger. Soil samples were taken at 2 ft intervals. All soil samples were field screened using an HNu photoionization unit. With the exception of two soil samples from GW-3, soil samples showed no evidence of contamination by organic vapors. Soil Samples GW-3G (12 to 14 ft below grade) and GW-3J (18 to 20 ft below grade) demonstrated some evidence of organic vapors. Headspace readings were 82 and 10 ppmv, respectively. Two soil samples from each borehole were submitted for laboratory analysis for total petroleum hydrocarbons and BTEX.

In addition to the three deep borings, two shallow borings were drilled adjacent to the foundation of the maintenance building to confirm the absence of contamination in the building's foundation footers. Soil borings SG-1 and SG-2 were drilled using a 4-1/4 in. hollow stem auger drill rig to a maximum depth of 20 ft below grade. Dry (or vadose) wells were installed as SG-1 and SG-2. Well construction diagrams for SG-1 and SG-2 are also presented in Appendix B. Each vadose well was allowed to equilibrate for 24 hours prior to sampling of the soil gas. Each vadose well was purged for 30 minutes using a Bellows vacuum pump. Following the purging, a soil gas sample was obtained in a Tedlar sample bag. The soil gas sample was then immediately analyzed using an HNu photoionization device. The HNu reading for both vadose wells were 1 ppmv.

Test borings GW-1, GW-2, and GW-3 were completed as ground water monitoring wells. Well locations for each well are shown in Exhibit 4. Ground water well construction diagrams are presented in Appendix B. All three monitoring wells were developed using a hand bailer. The top of the well casing elevations and ground surface elevations for GW-1, GW-2, and GW-3 were surveyed. An arbitrary reference was used in the absence of a U.S.G.S. benchmark. Depth to ground water was measured in GW-1, GW-2, and GW-3 on May 17, 1990 and ground water elevations were calculated. These ground water elevations showed that ground water flow was in a southwestern direction.

Ground water samples were collected from GW-1, GW-2, and GW-3 as well as MW-1, MW-2, and MW-3. Prior to sampling, each ground water monitoring well was purged at least three well volumes. Ground water samples were collected using a teflon bailer. All raw data and chain-of-custody forms are presented in Appendix C.

SUMMARY OF FINDINGS

A total of 9 soil borings (6 were completed as ground water monitoring wells) were installed to identify and delineate any contamination from the UST cavity. The soil borings and monitoring wells were sampled at both 5 and 2 ft intervals to depths ranging from 20 to 30 ft. The placement of these borings (and wells) was designed in a radial pattern in order to help identify the movement of potential contaminants through the surrounding area. All soil samples were screened using an HNu photoionization unit. A summary of field readings associated with the Phase II investigation and subsequent field investigation performed under the corrective action plan are presented in Exhibit 5. All soil samples were analyzed for total petroleum hydrocarbons (TPH) using the U.S. Environmental Protection Agency (U.S. EPA) Method 418.1 and benzene, toluene, ethyl benzene, and toluene (BTEX) using U.S. EPA Method 8020. These data are presented in Exhibit 6.

The data in Exhibit 5 show that soil contamination was limited to the immediate tank cavity and the capillary zone. The capillary zone extends from the phreatic surface up to the limit of capillary rise of water. The thickness of the zone typically ranges from practically nothing in course material to 2 to 3 ft in fine materials (i.e. clay, etc.).

The results of laboratory analyses of soil samples are presented in Exhibit 6. Soil samples from GW-1 and GW-3 had high TPH values. In both cases, these soil samples were taken from the capillary zone. Low levels of ethyl benzene and xylene were also found in GW-1. The absence of benzene and toluene in sample GW-1 seems to indicate that the contamination has been in place for some time and did not occur recently. The results of the lab analyses of soil samples corresponds well with the field/headspace reading presented in Exhibit 5.

A complete round of ground water samples were obtained from each of the monitoring wells (MW-1 through MW-3 and GW-1 through GW-3). In addition, monitoring wells MW-1 through MW-3 were sampled as part of the Phase II investigation. Prior to sampling, all monitoring wells were purged by baling a minimum of 3 well volumes of water from each well. In addition, a visual inspection of water quality was performed, and pH and temperature was monitored to assure that water representative of the surrounding formation was being sampled.

Laboratory results of the ground water samples are presented in Exhibit 7. Ground water samples were analyzed for total petroleum hydrocarbon (TPH) (U.S. EPA Method 418.1) and benzene, toluene, ethyl benzene, and xylene (BTEX) (U.S. EPA Method 8020). Ethyl benzene and xylene were identified in MW-1 during both sampling rounds. All four components of BTEX were identified during the Phase II investigation, but were absent in the second sampling round. Benzene, toluene, ethyl benzene, and xylene (BTEX) were also identified in GW-1. Though some variation was observed, the BTEX components of gasoline were definitely identified in both the east and west sides of the

EXHIBIT 5

FIELD SCREENING OBSERVATIONS

Sample Location	Depth (ft)	Field Reading (ppmv)
B-1-1 (MW-1)	4-6	<1
B-1-2 (MW-1)	9-11	<1
B-1-3 (MW-1)	14-16	<1
B-1-4 (MW-1)	19-21	<1
B-1-5 (MW-1)	24-26	<1
B-1-6 (MW-1)	29-31	<1
B-1-7 (MW-1)	34-36	15-20
B-2-1	4-6	<1
B-2-2	9-11	<1
B-2-3	14-16	<1
B-2-4	19-21	<1
B-3-1 (MW-2)	4-6	<1
B-3-2 (MW-2)	14-16	<1
B-3-3 (MW-2)	19-21	<1
B-3-4 (MW-2)	24-26	<1
B-3-5 (MW-2)	29-31	9
B-3-6 (MW-2)	34-35	300
B-4-1 (MW-3)	14-16	1
B-4-2 (MW-3)	21-23	1
B-4-3 (MW-3)	24-26	1
B-4-4 (MW-4)	29-31	<1
GW-1 A through G	0-15	0
GW-1 H	18-20	1
GW-1 I	23-25	0
GW-1 J	28-30	180
GW-2 A through E	0-11	0
GW-2 F	11-13	1
GW-2 G	13-15	1
GW-2 H	18-20	<0
GW-2 I	23-25	0
GW-2 J	28-30	0
GW-3 A though F	0-12	<1
GW-3 G	12-14	82
GW-3 H	14-16	1.2
GW-3 J	18-20	10
GW-3 K	23-25	<1
GW-3 L	28-30	1

EXHIBIT 6

RESULTS OF SOIL ANALYSES

Sample Number	Date Sampled	Depth (ft)	Benzene (ug/kg)	Ethyl Benzene (ug/kg)	Toluene (ug/kg)	Xylene (ug/kg)	TPH (mg/kg)
GW-1-H	05/07/90	19.5	N/D	N/D	N/D	N/D	80
GW-1-J	05/07/90	29.5	N/D	206	N/D	309	13,100
GW-2-F	05/07/90	12.5	N/D	N/D	N/D	N/D	47
GW-2-J	05/07/90	29.5	N/D	N/D	N/D	N/D	202
GW-3-G	05/07/90	14	N/D	N/D	N/D	N/D	10,500
GW-3-J	05/07/90	20	N/D	N/D	N/D	N/D	20

EXHIBIT 7

RESULTS OF GROUND WATER SAMPLES

Sample Number	Date Sampled	Depth (ft)	Benzene+ (ug/L)	Ethyl+ Benzene (ug/L)	Toluene+ (ug/L)	Xylene+ (ug/L)	TPH (mg/L)
MW-1	04/18/90	N/A	N/D	4,040	N/D	19,200	45
MW-2	04/18/90	N/A	N/D	N/D	N/D	N/D	58
MW-3	04/18/90	N/A	N/D	N/D	N/D	N/D	N/D
GW-1	05/11/90	N/A	554	780	34	19,200	1,820
GW-2	05/11/90	N/A	N/D	N/D	N/D	N/D	6
GW-3	05/11/90	N/A	N/D	N/D	N/D	N/D	N/D
MCL	05/11/90	N/A	5	700	2,000	10,000	N/A

+ U.S. EPA Method 604.
MCL Maximum Contaminant Level.
N/A Not Applicable.
* Proposed Federal Drinking Water Standards.

maintenance building. All raw laboratory data and chain of custody forms are contained in Appendix C of this report.

DETERMINATION OF SITE SPECIFIC HYDROGEOLOGIC CHARACTERISTICS

To supplement the information obtained from previously referenced work, a series of slug tests were performed to establish an in-field permeability within the aquifer. Calculation of the permeability and ultimately the hydraulic conductivity serve as key components in designing recovery wells and pumps.

All six ground water monitoring wells were slug-tested to evaluate the hydraulic conductivity of the uppermost aquifer. The slug test procedure consists of quickly lowering the water level in the well from the static water level and measuring the rate of rise of the water level in the well (rising head slug test). The tests were conducted using an In-Situ pressure transducer and data logger to record the rate of rise of the water level.

The hydraulic conductivity was calculated using the Bouwer and Rice Method (Bouwer, H. and R.C. Rice, 1876, a slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research v. 12, pp. 423-428). Exhibit 8 presents the results of the slug tests; slug test data are presented in Appendix D.

The hydraulic gradient was estimated based on the slug test results. Darcy's Law can be used to calculate the velocity of ground water beneath the site. Darcy's law states:

$$v = ki$$

Where: v = Darcy's velocity of ground water
K = Hydraulic conductivity
i - Hydraulic gradient

To calculate the actual velocity of ground water (Vm) the Darcy velocity is divided by porosity (n); therefore, the actual velocity of ground water becomes:

$$Vm = ki/n$$

An average k value of 50 ft/day was used for calculations. The hydraulic gradient is approximately 0.0008. Porosity for soils at the site is estimated at about 35 percent (0.35) in published literature. Using these values, the actual ground water velocity beneath the site is about 0.11 ft/day, or approximately 1,000 ft per year.

EXHIBIT 8

SLUG TEST RESULTS - HYDRAULIC CONDUCTIVITY

Well	K(m/sec)	K(cm/sec)	K(ft/day)
MW-1	1.6 E-04	1.6 E-02	46.12
MW-2	1.4 E-04	1.4 E-02	39.70
MW-3	4.8 E-05	4.8 E-03	13.54
MW-1	5.7 E-04	5.7 E-02	161.21
MW-2	1.4 E-04	1.4 E-02	40.58
MW-3	2.2 E-04	2.2 E-02	63.45

SITE REMEDIATION

The data presented in the Summary of Findings section indicate that no soil contamination and limited ground water contamination exist at both the east and west sides of the maintenance garage. The field investigation shows that only soils immediately above the water table (capillary zone) contained the volatile components of gasoline.

The ground water data suggest contamination exists on the east and west sides of the maintenance building. The ground water wells located along the west and south sides of the maintenance buildings have identified an area of contamination approximately 70 ft in length perpendicular to the flow of ground water.

A review of remedial technologies was performed based on the ground water data generated during the Phase II investigation and the corrective action study. From this evaluation, the following two technologies were reviewed:

1. Bioremediation

2. Ground water removal and treatment with air stripping.

The in-situ biotreatability of BTEX compounds in ground water has been documented in the literature. Usually, natural occurring microbes that are present in subsurface environments can degrade BTEX type pollutants if they are provided with a source of dissolved oxygen and nutrients such as nitrogen and phosphorus.

A conceptual overview of an in-situ bioremediation system would consist of the following components:

1. An extraction well to remove ground water from the upper aquifer. This ground water will have nutrient and dissolved oxygen added to help provide the optimum environment for microbial development.

2. An equilization tank will be used to allow for a constant flow through the nutrient addition and oxygen enhancement tanks.

3. A nutrient addition tank will be used to mix a commercial fertilizer with the ground water. The fertilizer will increase the presence of nitrogen and phosphorus in the water. These two components are key to the growth of micro-organisms.

4. An oxygen enhancement tank will be used to add hydrogen peroxide to the ground water to increase its level of dissolved oxygen. The dissolved oxygen will be consumed by the micro-organisms when they metabolize the BTEX compounds.

5. An infiltration galley, which consists of horizontal perforated pipe, will introduce the nutrient and oxygen enhanced water into the contaminated ground water system.

Following these five steps, conditions in the shallow aquifer will be ideal for naturally occurring micro-organisms to grow and consume the BTEX compounds.

It is envisioned that a bench top treatability study will be performed to assure that the naturally occurring organisms will respond to the nutrient and oxygen additions. A conceptual layout of the bioremediation system is presented in Exhibit 9.

The bench top study will also document the effectiveness of the micro-organisms as they metabolize (or consume) BTEX compounds. If the bench top study shows that bioremediation will not be effective at this site, the second option for ground water removal and treatment will be used. The following sections will present and discuss the components of a ground water removal and treatment system.

GROUND WATER RECOVERY WELLS

SCS utilized RESCUE Version 1.10 (Dr. M.S. Beljin, 1989) to assist in the design of the ground water recovery well network. The objective of this modeling effort was to determine recovery well placement which would be adequate to recover and contain contaminated ground water. This well network design was based on a ground water flow direction to the southwest at approximately 42 ft per year. This ground water flow rate was calculated from the results of an in-situ slug test performed by SCS Engineers in May 1990.

RESCUE is a complete pre- and post-processor for the computer program RESSQ (Javandel et al. 1984). RESSQ was used to calculate streamline flow patterns from a number of zero-flow rate injection wells placed at specific points around a pumping well. Each zero-flow rate injection well represents a point source and act as streamline starting points. The streamlines from the zero-flow rate wells show the direction that contaminants move due to the effects of regional ground water flow and the recovery well's pumping rate.

The following assumptions are made by RESSQ:

-- the modeled aquifer is a homogeneous/isotropic confined aquifer of uniform thickness;

-- regional flow, sources, and sinks create a steady state ground water flow.

The water-table aquifer is unconfined at the site, (i.e., not following RESSQ's assumption). However, this should only affect the amount of time required for the calculated radius of influence to be reached in the water-table aquifer as compared to a confined aquifer under similar conditions.

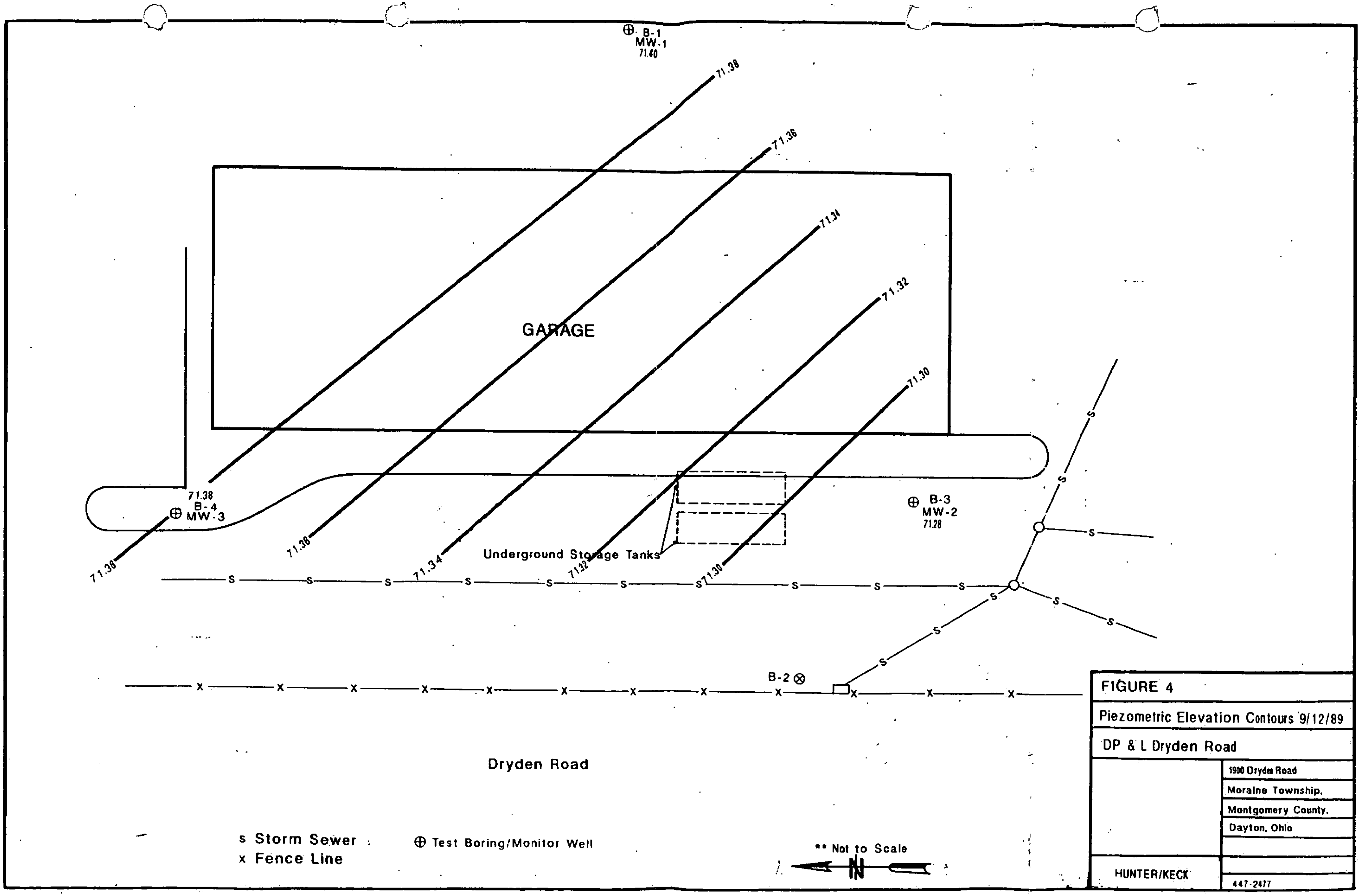


FIGURE 4

Piezometric Elevation Contours 9/12/89

DP & L Dryden Road

1900 Dryden Road
Moraine Township,
Montgomery County,
Dayton, Ohio

HUNTER/KECK

447-2477

A square grid (420 ft x 420 ft) was developed for the site with the origin located 60 ft west of the northwest corner of the garage. South was used as the positive X-axis. Grid lines were spaced at 60 ft intervals. X and Y coordinates were obtained for the recovery well and for each zero-flow injection wells placed in a square with the recovery well at the center.

The following information obtained from previous site investigations and research was used for the model:

-- aquifer thickness of 25 ft
-- porosity at 20 percent (.20)
-- velocity of ground water flow - 41.71 ft per year
-- direction of regional flow - southwest.
-- period of study - 6 months
-- pumping rate - 25 gallons per minute

Using initial injection well locations and the above listed information, RESSQ was run to determine whether the streamline of each injection well would be captured by the extraction well. All streamlines were captured during the initial run. Subsequent runs were made by placing the injection well locations further from the extraction well (keeping the square intact), until one or more of the streamlines were not captured by the pumping well. The point at which the first streamline was not captured was assumed to be just beyond the recovery well's radius of influence. Several additional runs were made to pinpoint the maximum radius of influence.

The RESSQ model calculated an effective radius of influence in excess of approximately 200 to 250 ft from the pumping well location. The radius of influence that will actually occur is dependent upon site-specific conditions and may be larger or smaller than determined by the RESSQ model.

Based upon the calculated radius of influence by the RESSQ model, the location of the recovery well will be based upon a conservative radius of influence of 180 ft. Given this value, SCS recommends that a recovery well be placed along the west boundary of the property approximately 50 ft west/southwest of the facility's garage. A second recovery well may be necessary to recover contamination from the eastern source.

The well should be installed to the top of the underlying confining layer (approximately 50 to 60 ft) and constructed of 4 in. inside diameter, PVC well screen and riser. The well screen should extend to several ft above the water table to allow for water level fluctuations. A recovery pump should be placed in the bottom third of the well and equipped with low and high level switches to prevent the pump from running dry.

WATER TREATMENT TECHNOLOGY

Contaminated ground water pumped from the aquifer must be treated prior to discharge to a sanitary sewer. Air stripping is a commonly used water treatment technology for removal of benzene, toluene, ethyl benzene, and xylene (BTEX) from ground water. In an air stripping system, contaminated water is mixed with clear air, and intimate contact causes a mass transfer process by which volatile contaminants are transferred to air.

Typically, an air stripping system consists of a water through air configuration utilizing a countercurrent packed tower. These systems create water droplets or a water film in which the mass transfer process occurs. A typical packed tower is 3 to 10 ft in diameter, 15 to 30 ft in height, and is packed with a ceramic, glass, or plastic media. Key operating parameters include: (1) air to water ratio, (2) water flow rate, (3) pressure drop across the column, (4) Henry's Law Constant for each contaminant, and (5) superficial gas velocity. A typical cross section of air stripping column is presented in Exhibit 10.

An air stripping column was sized using the concentrations of BTEX encountered during the field investigation. The actual mass transfer calculations were performed using a computer program created by Lantec Technologies. A summary of the design and operating parameters are shown in Exhibit 11. The design assumes that 3 in. Lantec brand packing will be used. Product literature for Lantec packing is presented in Appendix E. A conceptual layout of the ground water removal system is presented in Exhibit 12.

The air stripping column would be 3 ft in diameter with an overall height of 33 ft. The column will accommodate an average water flow rate of 100 gallons per minute. Approximately 800 cu ft per minute of air will pass counter current through the column creating an air-to-water ratio of 60 to 1.

The air stripping column will remove the contaminants to a concentration of 10 parts per billion (ppb) or less. Actual concentrations of benzene and toluene should be 1 ppb or less. The designed column should have an average removal efficiency of 98.9 percent. Benzene and xylene will be removed in excess of 99.9 percent. All water, air, and contaminant properties were taken from "The Properties of Gases and Liquids", 3rd Edition by Reid, Prausnitz and Sherwood.

REGULATORY REQUIREMENTS

Based on the choice of remedial technologies, state and local permits must be obtained to institute a cleanup of the identified area. A listing of relevant regulating agencies and permits for both remedial technologies are presented as follows:

EXHIBIT 10

TYPICAL CROSS SECTION OF AN AIR STRIPPING COLUMN

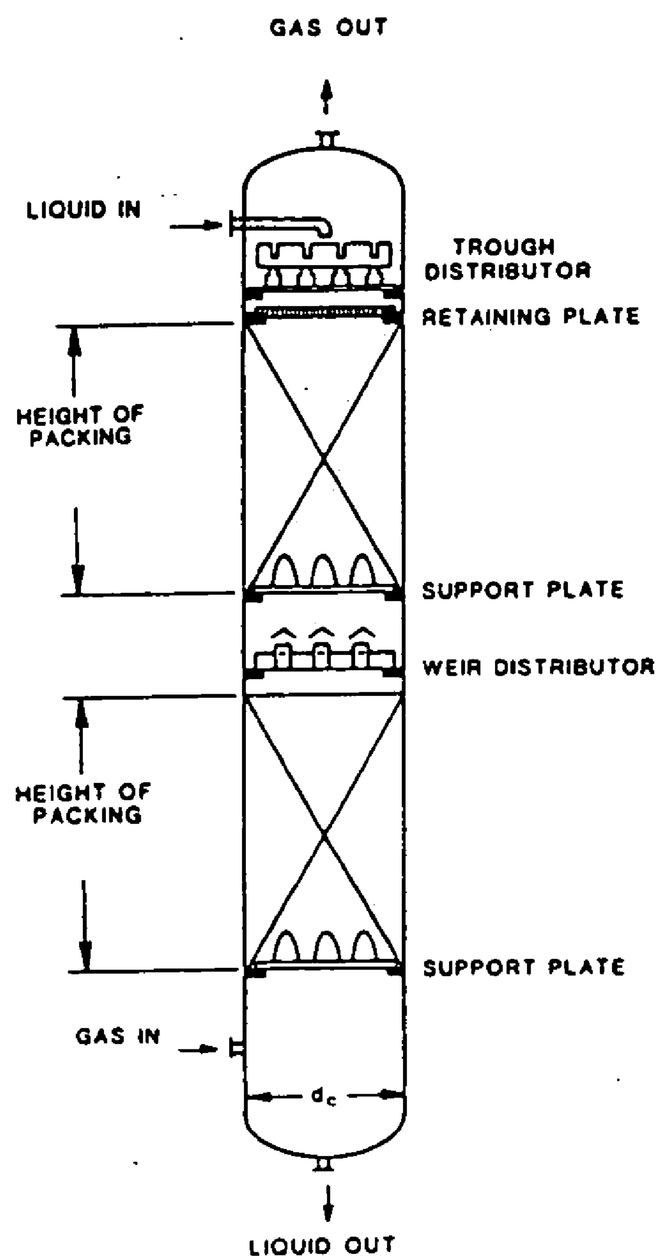


EXHIBIT 11

DESIGN PARAMETERS OF AIR STRIPPING COLUMN
DAYTON POWER & LIGHT COMPANY

Containment	Feed Concentration (ppb)	Effluent Concentration (ppb)	Removal Effluent (%)	Henry's Law Constant (Atm)	Total Packing Height	Tower Pressure Drop (in. W.C.)
Benzene	550	1	99.95	219	20.1	0.44
Toluene	34	1	97.06	262	10.1	0.22
Ethyl Benzene	780	10	98.72	270	19.5	0.43
Xylene	19200	10	99.95	236	24.1	0.53

Based on:

Stripping Tower Diameter: 3 ft
Packing Type and Size: Lanpac, 3.5 in.

Water Flow Rate: 100 gpm
Water Temperature: 11C
Water Density: 62.3 lb/ft^3
Water Viscosity: 3.28 lb/hr - ft
Water Loading Rate: 14.1 gal/ft^2

Air/Water Ratio: 60
Air Flow Rate: 802 CFM
Air Density: 0.077 lb/ft^3
Air Loading Rate: 528 lb/hr - ft^2
Superficial Gas Velocity: 1.89 ft/sec

Note:

1. Critical properties taken from "The Properties of Gases and Liquids", 3rd Edition, Reid, Prausnitz and Sherwood.

Bioremediation

-- Ohio Environmental Protection Agency (Ohio EPA), Division of Ground Water: Approval of ground water well and infiltration gallery.

Ground Water Recovery and Air Stripping

-- Bureau of Underground Storage Tank Regulation (BUSTR): Approval of corrective action plan and remediation technology.

-- Ohio Environmental Protection Agency (Ohio EPA), Division of Air: An air source permit for the air stripping column would have to be issued by the regional air pollution control authority.

-- Ohio Environmental Protection Agency (Ohio EPA), Division of Water: If treated water is discharged to City of Dayton, Sanitation Sewer System, a permit to install a pretreatment system would be obtained from Ohio EPA.

-- City of Dayton, Department of Public Works, Division of Wastewater: The City of Dayton would have to approve any discharge of treated water to their sanitary sewer system. If access was denied, a National Pollution Discharge Elimination System (NPDES) permit would have to be obtained to discharge treated water to the storm sewer system.

CONCLUSIONS AND RECOMMENDATIONS

It has been determined that a release of product has occurred at the Dayton Power & Light facility located at 1900 Dryden Road in Dayton, Ohio. As part of the UST closure, contaminated backfill was identified and disposed at a certified landfill. In addition, limited ground water contamination was identified at two separate areas at the east and west sides of the maintenance building.

From the information generated during the earlier investigation and the UST closure, the following recommendations are offered:

1. A bench scale evaluation of the in-situ Bioremediation process performed. The in-situ Bioremediation process will ultimately reduce the levels of BTEX to a lower level than other remedial technologies such as water removal and stripping system.

2. If the bench scale evaluation of the biotechnology proves positive, a full-scale system should be designed and implemented.

3. If the bench scale evaluation of the biotechnology is negative, a full scale pump and treatment system using an air stripping column should be designed and implemented.

4. Regardless of the treatment technology, post-treatment of the ground water should be performed. This sampling would establish that concentration of benzene, toluene, ethyl benzene, and xylene are equal to or less than U.S. Drinking Water Standards as established by each compounds maximum contaminant level (MCL). The MCL's are as follows:

Benzene	5 ppb
Toluene	2,000 ppb now 1000
Ethyl benzene	700 ppb
Xylene	10,000 ppb

APPENDIX A

BORING LOGS

B_RING/WELL LOG DATA
KECK CONSULTING SERVICES, INC.

PROJECT: DP&L: Dryden Road	WELL/BORING No.: MW-1/B-1
LOCATION: Dayton, Ohio	DATE DRILLED: 8/1/89
DRILLING METHOD: Hollow Stem Auger	CASING TYPE/DIA.: Schd. 40 PVC/2-inch
TOTAL DEPTH DRILLED: 37 feet	TOTAL CASING: 34.45 feet
GROUND ELEVATION: 98.39 feet	T.O.C. ELEVATION: 97.80 feet
GROUT TYPE/QUANTITY: Bentonite and Cement/ approx. 75 gallons	SCREEN TYPE/LENGTH: PVC/10 feet
GROUT INTERVAL(S): Surface to 21 feet	SCREENED INTERVAL: approx. 24.4 to 34.4 feet
DEPTH TO WATER: approx. 27 feet	GRAVEL PACK TYPE: Keck #50
WATER LEVEL ELEVATION:	GRAVEL PACK INTERVAL: 23 to 25 feet
	STATIC WATER LEVEL: 26.40 feet DATE: 9/12/89

REMARKS: All elevational data has been referenced to an arbitrary benchmark.

LOGGED BY: Timothy F. Hebert	SIGNATURE:

In feet DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - .5		Asphalt
.5 - 7.5		Sand and Gravel; Coarse gravel, well rounded, medium to fine sand, brown, not saturated, fill material
7.5- 16		Sandy Clay; black-brown, moist, disturbed soils (fill) containing glass and oxidized metal, not saturated, minor perched water may be present at approx. 14 feet, identified a thin stringer of brown clay at 15.5 feet, poor cutting returns, brown clay contains some medium to coarse gravel and was cohesive.
16 - 37		Sand and Gravel; medium to coarse and and gravel, hard drilling due to large cobbles, poorly sorted with some silts, appears saturated at approximately 27 feet

SPLIT SPOON SAMPLING

Interval	Number	Blow Counts	Recovery	PID	Comments
4 - 6	SS1	7,21,22,27	approx. 10 inches	< 1 ppm	Sand and gravel, brown, not saturated
9 - 11	SS2	4,4,6,10	approx. 10 inches	< 1	Sandy Clay, black-brown
14 - 16	SS3	6,8,10,20	approx. 17 inches	< 1	Sandy Clay, ASA to 15.5 feet, brown clay to 16 feet
19 - 21	SS4	6,8,10,12	approx. 10 inches	< 1	Sand and gravel, brown, medium to coe
24 - 26	SS5	18,18,19,22	approx. 9 inches	< 1	Sand and gravel, ASA
29 - 31	SS6	44,25,22	approx. 11 inches	< 1	Sand and gravel, ASA
34 - 36	SS7	23,27,44	Not recorded	40-50 ppm	Sand and gravel, ASA, soil sample has strong gasoline odor

BORING/WELL LOG DATA
KECK CONSULTING SERVICES, INC.

PROJECT: DP&L: Dryden Road	WELL/BORING No.: MW-2/B-3
LOCATION: Dayton, Ohio	DATE DRILLED: 8/25/89
DRILLING METHOD: 4½-inch Hollow Stem Auger	CASING TYPE/DIA.: PVC/2.0 inch
TOTAL DEPTH DRILLED: 36 feet BGL	TOTAL CASING: 35.62 feet
GROUND ELEVATION: 98.19 feet	T.O.C. ELEVATION: 97.86 feet
GROUT TYPE/QUANTITY: See groundwater monitoring well completion diagrams	SCREEN TYPE/LENGTH: 0.010 PVC/10 feet
GROUT INTERVAL(S): "	SCREENED INTERVAL: 25.6 to 35.6 feet
DEPTH TO WATER: 26.0 feet BGL	GRAVEL PACK TYPE: No. 5 Quartz Sand
WATER LEVEL ELEVATION:	GRAVEL PACK INTERVAL: 23.8 to 36.1 feet
	STATIC WATER LEVEL: 26.58 ft. DATE: 9/12/89

REMARKS: One sample every 5 feet; BGL = below ground level

LOGGED BY: Paul Stork

SIGNATURE:

In feet DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - .5		Asphalt
4 - 6	B3-1	0.75 feet Fill, fine gravelly sand, some medium and coarse sand,
10,30,44,19	1045	trace silt and clay, poor sorting and subrounded to sub-
		angular, dry, tan. 0.75/2.0 Recovery
9 - 11		No recovery, pushed cobble. Note: at 7.0 feet, auger cuttings were
12,12,11,6		black, sandy gravel, with coal ash-like odor (fill)
14 - 16	B3-2	0.8 feet Fill, silty clay, some medium sand and cinders, moist,
3,12,15,10	1103	low plasticity, black, roofing tar odor
		0.2 feet Fine gravelly clay, medium plasticity, slightly moist, tan
		1.0/2.0 Recovery
19 - 21	B3-3	0.7 feet Fill, medium sand and fine gravel with clay, poor
12,15,10		sorting, slightly moist, tan. 0.7/2.0 Recovery
24 - 16	B3-4	0.5 feet Pounded through quartzite coarse gravel
87-106-37,19	1135	0.4 feet Fine gravel with coarse, medium, and fine sand, trace silt,
		poor sorting, moist, tan
		0.1 feet Fine gravelly clay, trace medium sand, medium plasticity,
		moist, tan, tip of spoon was saturated with water
		1.0/2.0 Recovery

BORING/WELL LOG DATA

KECK CONSULTING SERVICES, INC.

PROJECT: DP&L: Dryden   PAGE: 2   DATE: 8/25/89   WELL/BORING No.: B-3

In feet DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
29 - 31	B3-5	0.8 feet Fine gravel, some coarse sand, trace silt and fine sand,
	1147	poor sorting, saturated, brown, slight hydrocarbon odor
		0.8/2.0 Recovery
34 - 35	B3-6	0.9 feet Fine gravel, trace coarse sand, well sorted, sub-
46,100/4	1206	rounded, grading into medium sand with fine sand, trace
		fine gravel and coarse sand, moderate sorting, saturated,
		brown, hydrocarbon odor. 0.8/0.9 Recovery

BORING/WELL LOG DATA
KECK CONSULTING SERVICES, INC.

PROJECT: DP&L: Dryden Road	WELL/BORING No.: B-2
LOCATION: Dayton, Ohio	DATE DRILLED: 8/3/89
DRILLING METHOD: Hollow Stem Auger	CASING TYPE/DIA.: N/A
TOTAL DEPTH DRILLED: 27 feet	TOTAL CASING: N/A
GROUND ELEVATION: 98.19 feet	T.O.C. ELEVATION: N/A
GROUT TYPE/QUANTITY: Bentonite and Cement/ approx. 90 gallons	SCREEN TYPE/LENGTH: N/A
GROUT INTERVAL(S): 0 - 27 feet	SCREENED INTERVAL: N/A
DEPTH TO WATER: approx. 26 feet	GRAVEL PACK TYPE: N/A
WATER LEVEL ELEVATION: N/A	GRAVEL PACK INTERVAL: N/A
	STATIC WATER LEVEL: N/A DATE:

REMARKS: The ground elevation at B-2 has been referenced to a benchmark of 100 feet. Was abandoned due to auger refusal.

LOGGED BY: Timothy F. Hebert | SIGNATURE:

In feet DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0 - .5		Asphalt
.5 - 6		Sand and Gravel; coarse gravel with medium to fine sand, brown, not saturated, fill material
6 - 17		Sandy Clay; black-brown, medium to fine sand, some indications of minor perched water at approximately 7 feet, soils are fill material as glass and oxidized metal fragments are present in cuttings
17 - 27		Sand and Gravel; brown, medium to coarse well rounded gravel, medium to coarse sand, poorly sorted, moist, saturation appears to be approximately 26 feet. Auger refusal at 27 feet, decided to abandon borehole and re-drill. Was bentonite/cement grouted through the augers to the near surface and plugged with granual bentonite. No well installed.

SPLIT SPOON SAMPLING

Interval	Number	Blow Counts	Recovery	PID	Comments
4 - 6	1	8, 8, 10, 11	approx. 12 inches	< 1	Sand & gravel, brown, fill
9 - 11	2	6, 6	approx. 8 inches	< 1	Sandy Clay, black-brown, fill
14 - 16	3	6, 8, 17	approx. 5 inches	< 1	ASA, fill
19 - 21	4	74, 26	approx. 12 inches	< 1	Sand and gravel, brown
24 - 26	5	17, 16, 17	no sample retained	NA	

BORING/WELL LOG DATA
KECK CONSULTING SERVICES, INC.

PROJECT: DP&L: Dryden Road	WELL/BORING No.: M-4
LOCATION: Dayton, Ohio	DATE DRILLED: August 28, 1989
DRILLING METHOD: Hollow Stem Auger	CASING TYPE/DIA.: PVC Sch. 40/2-inch
TOTAL DEPTH DRILLED: 31 feet	TOTAL CASING: Approx. 31 feet
GROUND ELEVATION: 98.55 feet	T.O.C. ELEVATION: 98.65 feet
GROUT TYPE/QUANTITY: Granular Bentonite/100 lbs. Bentonite Cement/45 gal.	SCREEN TYPE/LENGTH: PVC/10 feet
GROUT INTERVAL(S): 15 to 18 feet 1 to 15 feet	SCREENED INTERVAL: 21 to 31 feet
DEPTH TO WATER: Approx. 26 feet	GRAVEL PACK TYPE: Natural Keck #5
WATER LEVEL ELEVATION:	GRAVEL PACK INTERVAL: 26 to 31 feet 18 to 26 feet
	STATIC WATER LEVEL: 27.27 ft. DATE: 9/12/89

REMARKS: M-4 is re-drill boring for B-4; No split-spoon samples collected at M-4

LOGGED BY: Timothy F. Hebert | SIGNATURE:

DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
		General Interpretation:
0 - 3"		Asphalt
3" - 1.5'		Backfill; grade stone
1.5 - 6'		Backfill; sand and gravel, brown, moist
6 - 14'		Sandy Clay; black, moist, appears to be fill material, saturated or perched zone of medium fine sand at approximately 11 feet, occasional fine gravel, increase gravel with depth, rough drilling at 14 feet
14 - 31'		Sand and Gravel; moist, medium coarse, poorly sorted, interbeds and gray-brown silt and clay indicated by drilling pressure. Rough drilling, break in drill pressure at 21 feet, poor cutting returns, refusal at 31 feet. Unit contains some substantial well rounded cobbles.

Log of Boring No. SG #1

S.C.S. ENGINEERS, DRYDEN ROAD, DAYTON, OHIO

Boring Location: As shown on boring location plan
Surface Elevation:
Date Started: 5-9-90
Date Completed: 5-9-90

Stratum:	Description of Material	Sample # & Type	Sample Depth	Blows Per 6"	"N" Blows/ft. Or Core Rec.
0.0'	(Fill) Brown sand and gravel, trace of silt - moist	1A	3.0- 5.0	3- 3- 3 -4	7
9.2'	(Fill)Black cinders and foundry sand, trace of cobbles - moist (Becomes very loose at 11.5') (Trace of water at 14.0')	2A	8.0-10.0	3- 3- 7-27	34
14.6'	(Original) Loose brown sand, some silt, some gravel, trace of clay -moist	3A	13.0-15.0	1- 1- 1- 5	6
16.0'	Medium dense brown sand and gravel, trace of silt, trace of cobbles - moist	4A	18.0-20.0	12-12-13-11	24
	Bottom of Boring at 21.5'				

Depth scale: 5', 10', 15', 20', 25', 30'

Method: Hollow Stem Auger
Technician: TA/SA
Job No. 46826

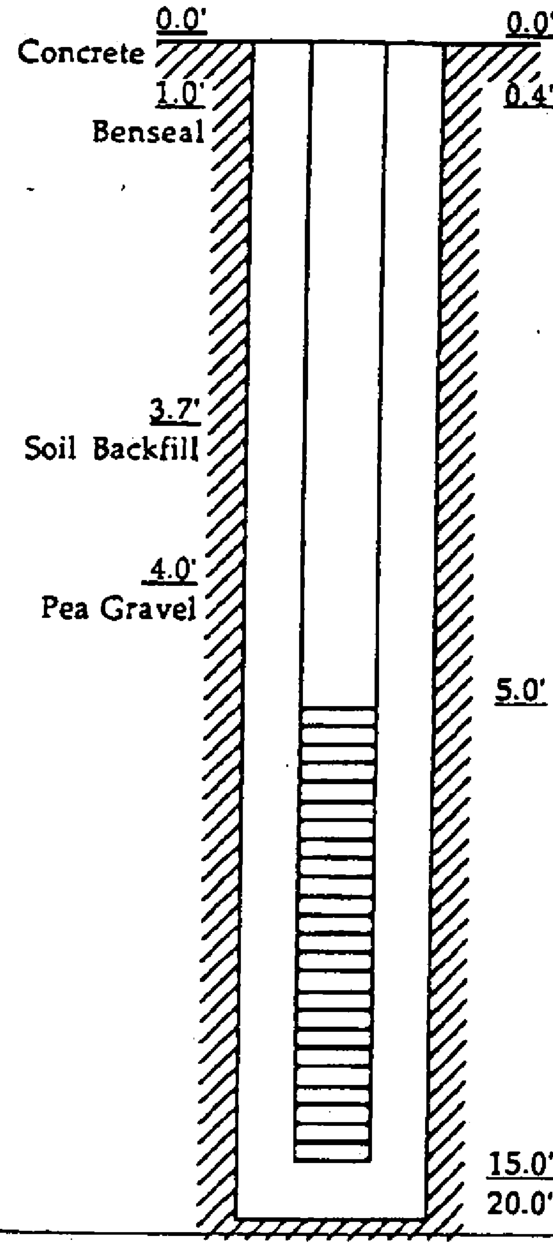
Water Observations
Initial Depth: Trace 14.0'
Completion Depth: None
Depth After: hrs.

Type Sampler
- [X] A. Split-Spoon
- [ ] B.
- [ ] C. Shelby Tube
- [ ] D.

LOG OF WELL NO. SG-2

S.C.S. ENGINEERS, DRYDEN ROAD, DAYTON, OHIO

46826	Job Number
5-9-90	Date Installed
TA	Technician
---	Surface Elevation
PVC	Riser Pipe Material
PVC	Screen Material
2"	Screen Diameter
0.010"	Screen Slot Size
20.0'	Bottom of Boring
15.0'	Bottom of Screen
5.0'	Top of Screen
4.0'	Top of Sand
---	Top of Bentonite Pellet
1.0'	Top of Bentonite Powder
0.0'	Top of Concrete
3.7'	Top of Soil Backfill
0.4'	Top of Well Riser Pipe
0.0'	Top of M.H. Cover
14.0'	Initial Water Depth
15.5'	Completion of Water Depth
	24 Hour Water Depth
	48 Hour Water Depth
	Hour Water Depth

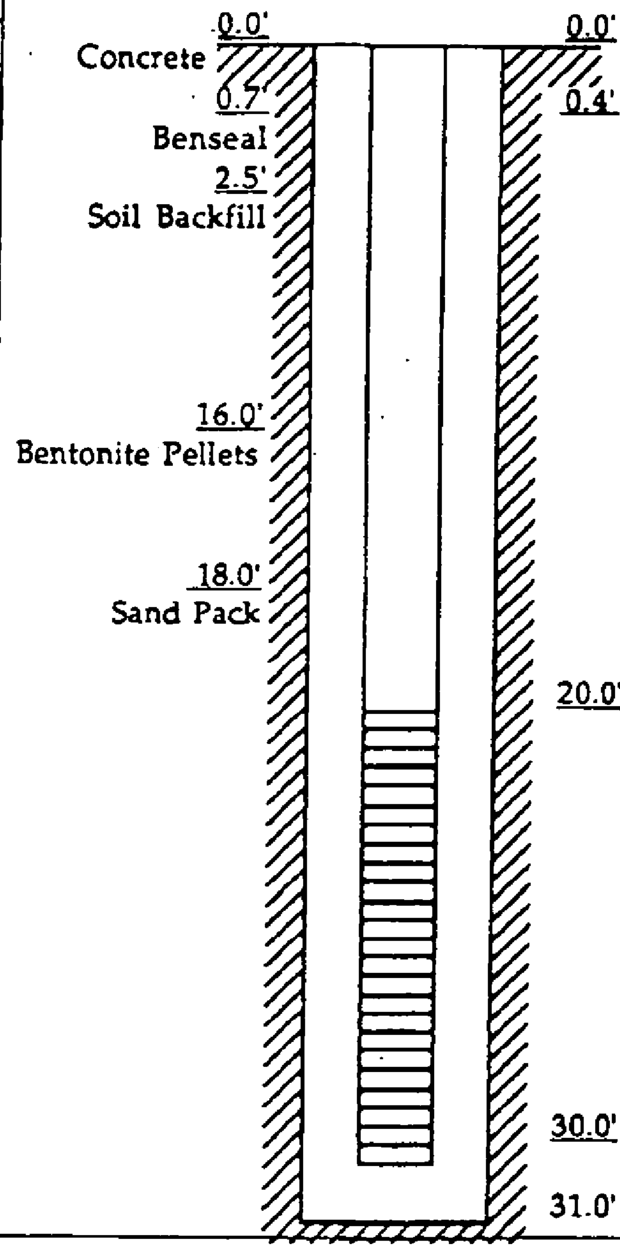


Remarks:

LOG OF WELL NO. GW-1

S.C.S. ENGINEERS, DRYDEN ROAD, DAYTON, OHIO

46826	Job Number
5-7-90	Date Installed
TA	Technician
---	Surface Elevation
PVC	Riser Pipe Material
PVC	Screen Material
2"	Screen Diameter
0.010"	Screen Slot Size
31.0'	Bottom of Boring
30.0'	Bottom of Screen
20.0'	Top of Screen
18.0'	Top of Sand
16.0'	Top of Bentonite Pellet
0.7'	Top of Bentonite Powder
0.0'	Top of Concrete
2.5'	Top of Soil Backfill
0.4'	Top of Well Riser Pipe
0.0'	Top of M.H. Cover
25.5'	Initial Water Depth
26.1'	Completion of Water Depth
	24 Hour Water Depth
	48 Hour Water Depth
	Hour Water Depth



Remarks:

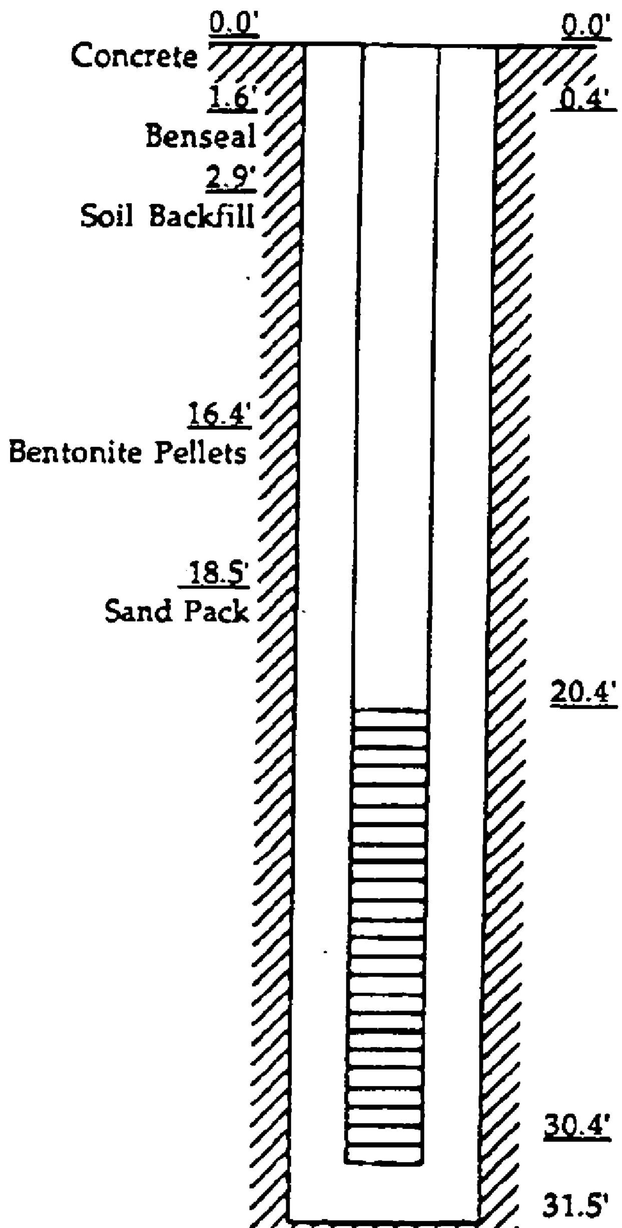
BOWSER

ED_001207_00000832

LOG OF WELL NO. GW-2

S.C.S. ENGINEERS, DRYDEN ROAD, DAYTON, OHIO

46826	Job Number
5-8-90	Date Installed
TA	Technician
—	Surface Elevation
PVC	Riser Pipe Material
PVC	Screen Material
2"	Screen Diameter
0.010"	Screen Slot Size
31.5'	Bottom of Boring
30.4'	Bottom of Screen
20.4'	Top of Screen
18.5'	Top of Sand
16.4'	Top of Bentonite Pellet
1.6'	Top of Bentonite Powder
0.0'	Top of Concrete
2.9'	Top of Soil Backfill
0.4'	Top of Well Riser Pipe
0.0'	Top of M.H. Cover
25.8'	Initial Water Depth
25.3'	Completion of Water Depth
	24 Hour Water Depth
	48 Hour Water Depth
	Hour Water Depth



Remarks:

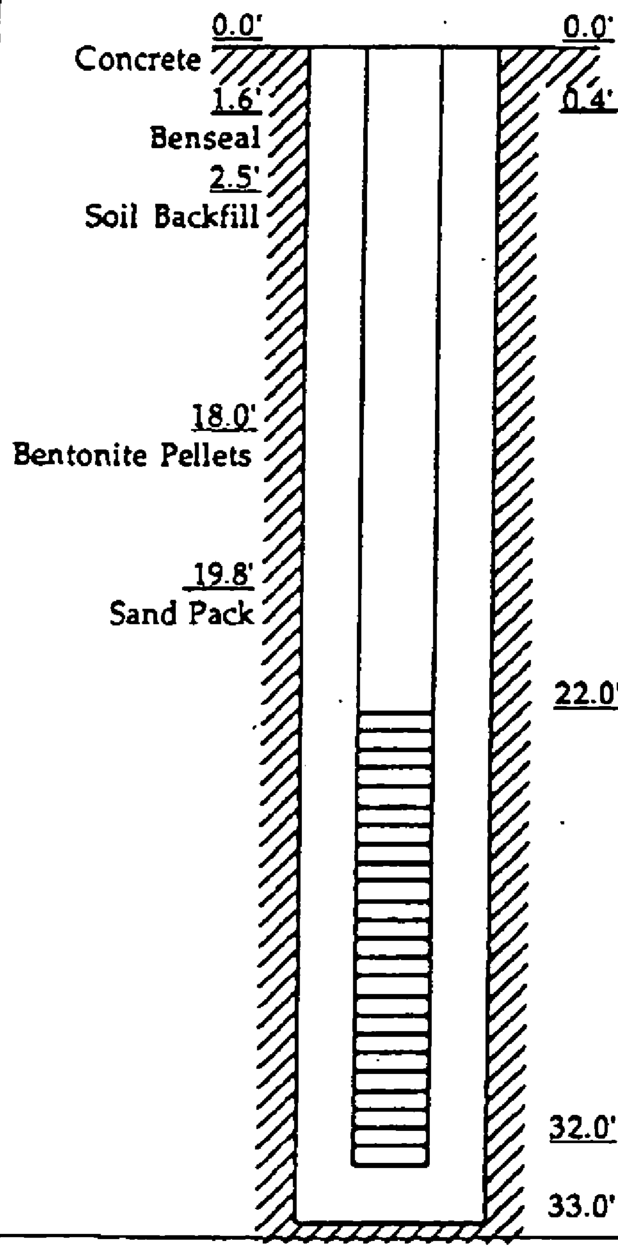
BOWSER

ED_001207_00000832

LOG OF WELL NO. GW-3

S.C.S. ENGINEERS, DRYDEN ROAD, DAYTON, OHIO

46826	Job Number
5-8-90	Date Installed
TA	Technician
---	Surface Elevation
PVC	Riser Pipe Material
PVC	Screen Material
2"	Screen Diameter
0.010"	Screen Slot Size
33.0'	Bottom of Boring
32.0'	Bottom of Screen
22.0'	Top of Screen
19.8'	Top of Sand
18.0'	Top of Bentonite Pellet
1.0'	Top of Bentonite Powder
0.0'	Top of Concrete
2.5'	Top of Soil Backfill
0.4'	Top of Well Riser Pipe
0.0'	Top of M.H. Cover
26.7'	Initial Water Depth
27.4'	Completion of Water Depth
	24 Hour Water Depth
	48 Hour Water Depth
	Hour Water Depth



Remarks:

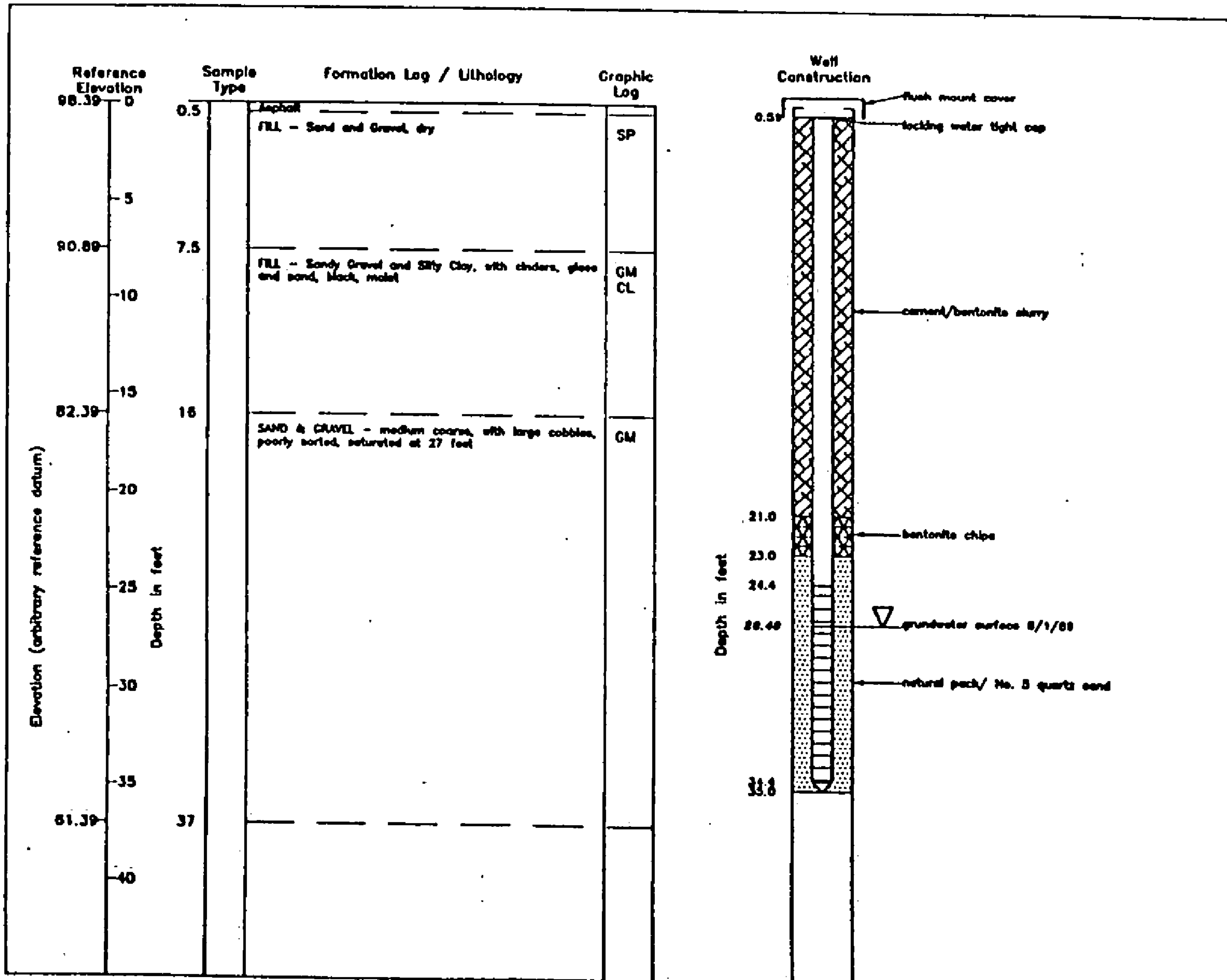
BOWSER

ED_001207_00000832

APPENDIX B

WELL CONSTRUCTION LOGS

B-2



WELL INSTALLATION INFORMATION

Well Number: MW-1 Total Depth: Below Top of Casing

Representative:

Started: Completed:

Drilling Method:

Well Cover: Flush Mount Cap: Locking Water Tight

Riser: Diameter: Material: PVC Joints: Length: Riser Interval:

Screen: Diameter: Material: PVC Type: Machine Slot: Length: Screened Interval:

Grout Material: Cement/Bentonite Slurry Quantity: Interval:

Seal Material: Bentonite Chips Quantity: Seal Interval:

Filter Pack Material: Natural Pack/ No. 5 Quartz Sand Quantity: Filter Interval:

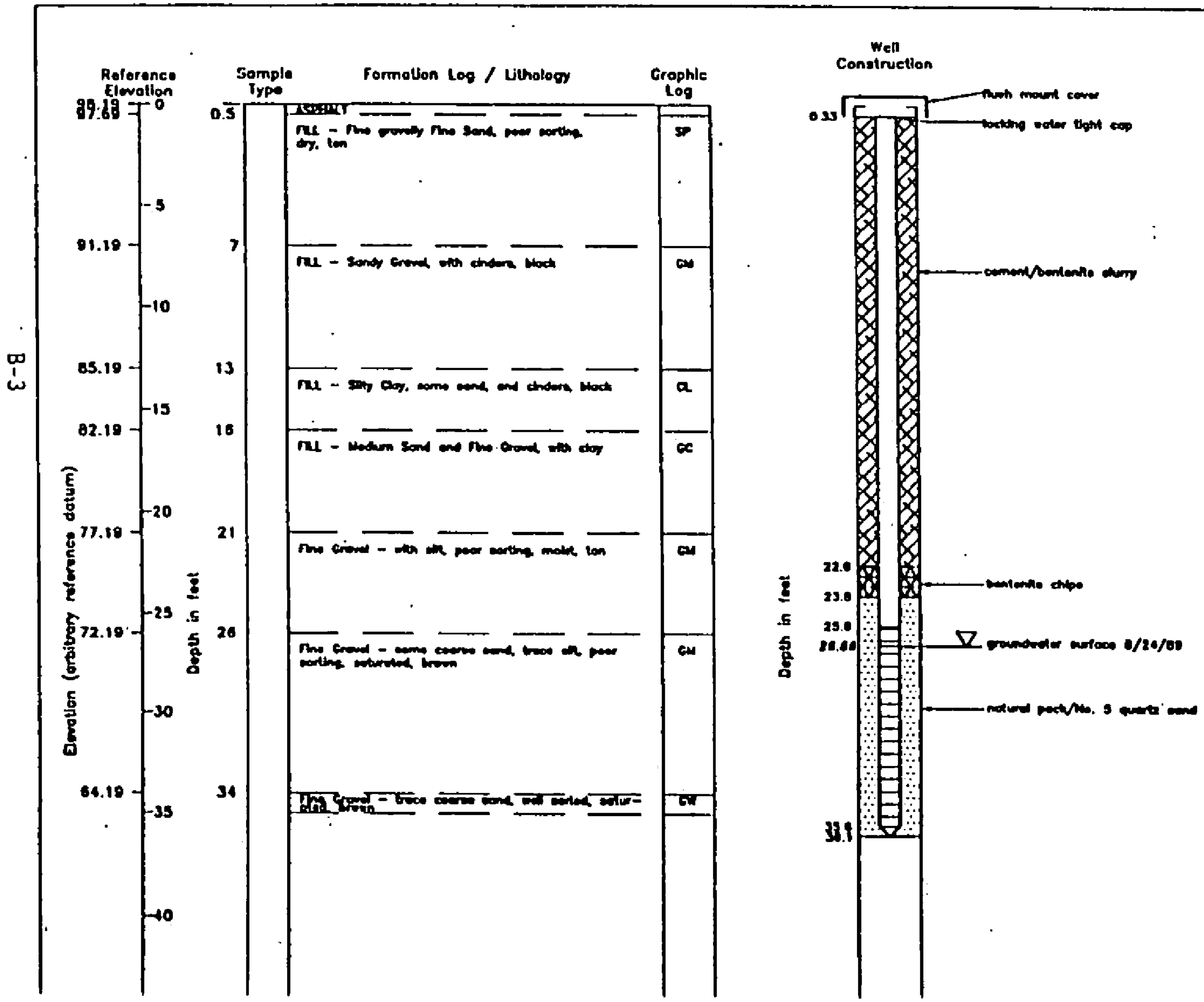
Depth to Groundwater:

Date:

GROUNDWATER MONITORING WELL COMPLETION DIAGRAM

TEST BORING	B-1
WELL	MW-1
SHEET	1 of 1 DATE 10/4/89
CLIENT	Dayton Power & Light
LOCATION	Dryden Road
PROJECT	447-2477

HuriTan/KECK



BECK CONSULTING SERVICES, INC.
WELL INSTALLATION INFORMATION

Well Number: [illegible] Total Depth: [illegible] Feet Below Top of Casing

BCS Representative: [illegible]

Started: [illegible] Completed: [illegible]

Drilling Method: [illegible]-inch Hollow Stem Auger

Well Cover: Flush Mount Cap: Locking Water Tight

Riser: Diameter: [illegible] Inches

Material: PVC

Joints: Machine Flush Threaded

Length: [illegible] Feet

Riser Interval: [illegible] to [illegible] Feet

Screen: Diameter: [illegible] Inches

Material: PVC

Type: Machine

Slot: [illegible] Inches

Length: [illegible] Ft.

Screened Interval: [illegible] Ft. to [illegible] Ft.

Grout Material: Cement/Bentonite Slurry

Quantity: [illegible] Gallons

Interval: Surface to [illegible] Feet

Seal Material: Bentonite Chips

Quantity: [illegible] lbs.

Seal Interval: [illegible] Ft. to [illegible] Ft.

Filter Pack Material: Natural Pack/ No. 5 Quartz Sand

Quantity: [illegible] lbs.

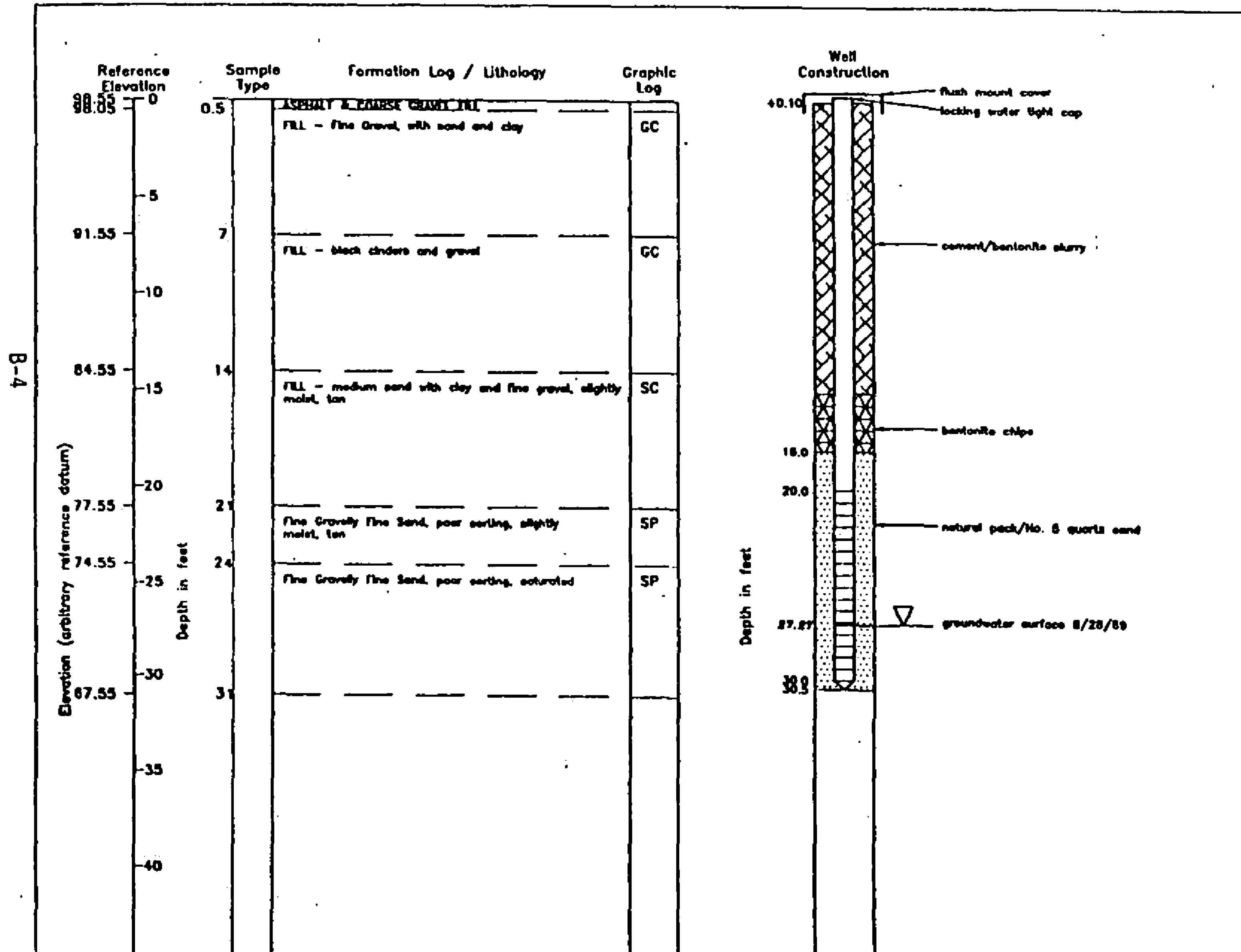
Filter Interval: [illegible] Ft. to [illegible] Ft.

Depth to Groundwater: [illegible] Ft. [illegible]

Date: [illegible]

GROUNDWATER MONITORING WELL COMPLETION DIAGRAM

TEST BORING	B-2
WELL	MW-2
SHEET	1 of 1 DATE 10/4/89
CLIENT	Dayton Power & Light
LOCATION	Dryden Road
PROJECT	447-2477



KECK CONSULTING SERVICES, INC.
WELL INSTALLATION INFORMATION

Well Number: [illegible] Total Depth: [illegible] Below Top of Casing

KCS Representative: [illegible]

Started: [illegible] Completed: [illegible]

Drilling Method: [illegible]

Well Cover: [illegible] Cap: [illegible]

Riser: Diameter: [illegible]

Material: [illegible]

Joints: [illegible]

Length: [illegible]

Riser Interval: [illegible] to [illegible]

Screen: Diameter: [illegible]

Material: [illegible]

Type: [illegible]

Slot: [illegible]

Length: [illegible]

Screened Interval: [illegible] to [illegible]

Grout Material: [illegible]

Quantity: [illegible]

Interval: [illegible]

Seal Material: [illegible]

Quantity: [illegible]

Seal Interval: [illegible] to [illegible]

Filter Pack Material: [illegible]

Quantity: [illegible]

Filter Interval: [illegible] to [illegible]

Depth to Groundwater: [illegible]

Date: [illegible]

GROUNDWATER MONITORING WELL COMPLETION DIAGRAM

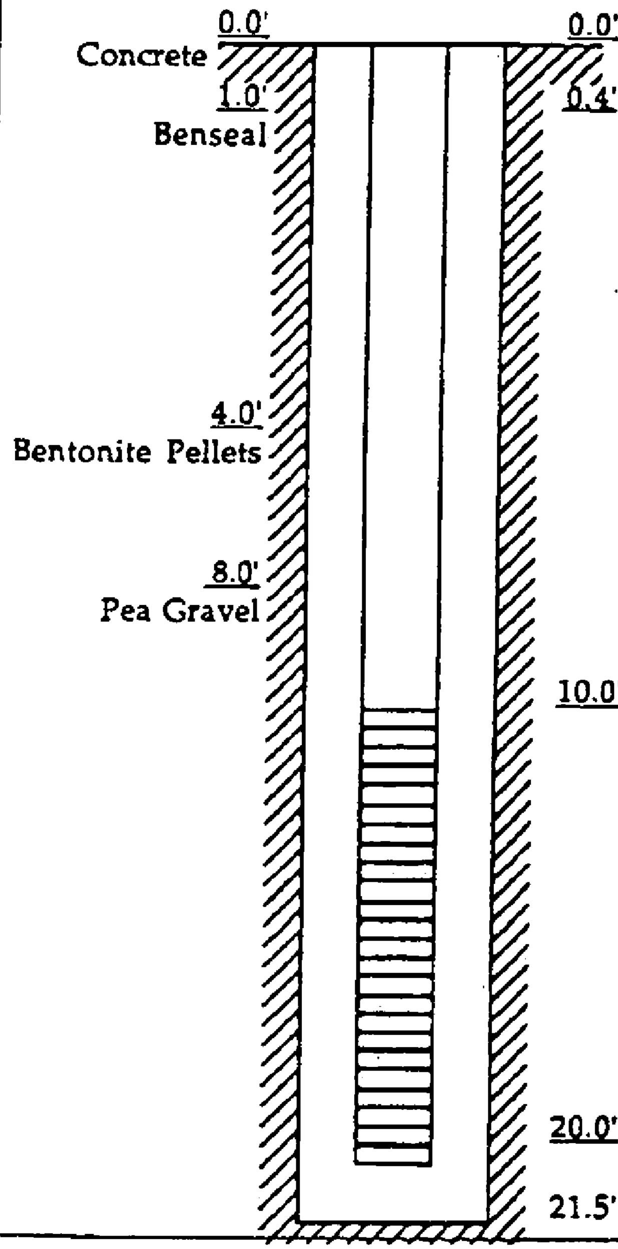
TEST BORING	B-3
WELL	MW-3
SHEET	1 of 1 DATE 10/4/89
CLIENT	Dayton Power & Light
LOCATION	Dryden Road
PROJECT	447-2477

HuntTon/KECK

LOG OF WELL NO. SG-1

S.C.S. ENGINEERS, DRYDEN ROAD, DAYTON, OHIO

46826	Job Number
5-9-90	Date Installed
TA	Technician
---	Surface Elevation
PVC	Riser Pipe Material
PVC	Screen Material
2"	Screen Diameter
0.010"	Screen Slot Size
21.5'	Bottom of Boring
20.0'	Bottom of Screen
10.0'	Top of Screen
---	Top of Sand
4.0'	Top of Bentonite Pellet
1.0'	Top of Bentonite Powder
0.0'	Top of Concrete
2.0'	Top of Soil Backfill
0.4'	Top of Well Riser Pipe
0.0'	Top of M.H. Cover
14.0'	Initial Water Depth
None	Completion of Water Depth
	24 Hour Water Depth
	48 Hour Water Depth
	Hour Water Depth
[illegible].0'	Top of Pea Gravel



Remarks:

BOWSER

Log of Boring No. SG #2

S.C.S. ENGINEERS, DRYDEN ROAD, DAYTON, OHIO

Boring Location: As shown on boring location plan
Surface Elevation:
Date Started: 5-9-90
Date Completed: 5-9-90

Stratum:	Description of Material	Sample # & Type	Sample Depth	Blows Per 6"	"N" Blows/ft. Or Core Rec.
0.0'	(Fill) Asphalt				
0.5'	(Fill) Brown sand and gravel trace of cobble - moist				
5'					
6.0'	(Fill) Black Cinder and foundry sand, trace of cobbles - moist				
10'		1A	8.0-10.0	8-9-17-6	23
	(Becomes very loose at 14.0')				
15.8'	(Trace of water and glass at 14.0')	3A	13.0-15.0	2-1-1-2	3
	(Original) Medium dense brown sand, some gravel, some silt, trace of clay, trace of cobbles - moist				
		4A	18.0-20.0	21-17-13-8	21
20'	Bottom of Boring at 20.0'				
25'					
30'					

Method: Hollow Stem Auger
Technician: TA/SA
Job No. 46826

Water Observations

Initial Depth: 14.0' light
Completion Depth: 15.5'
Depth After: hrs.

Type Sampler

[X] A. Split-Spoon
[ ] B.
[ ] C. Shelby Tube
[ ] D.

Log of Boring No. GW-1

S.C.S. ENGINEERS, DRYDEN ROAD, DAYTON, OHIO

Boring Location: As shown on boring location plan
Surface Elevation:
Date Started: 5-7-90
Date Completed: 5-7-90

Stratum:	Description of Material	Sample # & Type	Sample Depth	Blows Per 6"	"N" Blows/ft. Or Core Rec.
0.0'	(Fill) Asphalt				
0.5'	(Fill) Brown sand and gravel, trace of cobbles - moist	1A	0.5 - 2.5	4 - 5 - 7 - 9	16
2.0'	(Fill) Foundry sand, some cobbles, trace of cinders, trace of gravel - moist	2A	2.5 - 4.5	8 - 9 - 10 - 7	17
5'		3A	4.5 - 6.5	2 - 3 - 5 - 5	10
		4A	6.5 - 8.5	9 - 4 - 3 - 4	7
10'		5A	8.5 - 10.5	4 - 5 - 4 - 6	10
		6A	10.5 - 12.5	4 - 3 - 3 - 7	10
14.0'	(Original) Medium stiff dark brown silt, some clay, trace of sand, trace of gravel - moist				
15'		7A	12.5-14.5	7 - 5 - 4 - 4	8
16.5'	Very dense brown sand and gravel, some cobbles, trace of silt- moist	8A	17.5-19.5	35-25-25-35	60
20'					
		9A	22.5-24.5	44-21-11-9	20
	(Becomes medium dense at 23.5')				
25'	(Becomes wet at 25.5')				
	(Becomes dense at 27.5')	10A	27.5-29.5	22-21-22-23	45
30'	Bottom of Boring at 31.0'				

Method: Hollow Stem Auger
Technician: TA/SA
Job No. 46826

Water Observations

Initial Depth: 25.5'
Completion Depth: 26.1'
Depth After: hrs.

Type Sampler

- [X] A. Split-Spoon
- [ ] B.
- [ ] C. Shelby Tube
- [ ] D.

Log of Boring No. GW-2

S.C.S. ENGINEERS, DRYDEN ROAD, DAYTON, OHIO

Boring Location: As shown on boring location plan
Surface Elevation:

Date Started: 5-8-90
Date Completed: 5-8-90

Stratum:	Description of Material	Sample # & Type	Sample Depth	Blows Per 6"	"N" Blows/ft. Or Core Rec.
0.0'	(Fill) Asphalt				
0.2'	(Fill)Brown sand and gravel, some silt - moist	1A	0.5 - 2.5	7-10-11-16	27
2.0'	(Fill) Medium dense brown sand and gravel, trace of silt, trace of cobbles - moist	2A	2.5 - 4.5	26-21-19-16	35
5'		3A	4.5 - 6.5	9-13-14-10	24
6.0'	(Fill) Black cinders and foundry sand - moist	4A	6.5 - 8.5	6 - 4 - 4 - 5	9
7.5'	(Fill) Medium stiff brown silt and clay, trace of gravel - moist				
8.5' / 10'	(Fill) Black cinders and foundry sand - moist	5A	8.5 -10.5	4 - 5 - 5 - 6	10
		6A	10.5-12.5	4 - 4 - 2 - 4	6
15'		7A	12.5-14.5	7 - 5 - 5 - 4	9
16.0'	(Original) Dark brown silt, some sand, some clay - moist				
17.5'	Medium dense brown sand and gravel, trace of silt, trace of cobbles - moist	8A	17.5-19.5	12-14-15-12	27
20'	(Becomes very dense at 23.5')	9A	22.5-24.0	22-23-110	100+
25'	(Becomes wet at 25.8')				
		10A	27.5-29.5	25-44-35-42	77
30'	Bottom of Boring at 31.5'				

Method: Hollow Stem Auger
Technician: TA/SA
Job No. 46826

Water Observations

Initial Depth: 25.8'
Completion Depth: 25.3'
Depth After: hrs.

Type Sampler

- [X] A. Split-Spoon
- [ ] B.
- [ ] C. Shelby Tube
- [ ] D.

Log of Boring No. GW-3

S.C.S. ENGINEERS, DRYDEN ROAD, DAYTON, OHIO

Boring Location: As shown on boring location plan

Surface Elevation:

Date Started: 5-8-90

Date Completed: 5-8-90

Stratum:	Description of Material	Sample # & Type	Sample Depth	Blows Per 6"	"N" Blows/ft. Or Core Rec.
0.0'	(Fill) Dense brown sand and gravel, some cobbles, trace of silt - moist	1A	0.0 - 2.0	7-11-13-20	33
	(Becomes very dense at 2.0')	2A	2.0 - 4.0	24-32-37-21	58
5'		3A	4.0 - 5.9	16-16-90-70/4"	100+
6.5'	(Fill) Cinders and foundry sand, - moist				
	(Trace of glass at 8.5')	4A	6.0 - 8.0	27- 8 -7 - 5	12
10'	(Trace of water at 10.0')	5A	8.0 -10.0	8 - 3 - 1 - 2	3
		6A	10.0-12.0	3 - 3 - 3 - 3	6
	(Trace of water at 13.0') (Trace of metal and glass at 14.0')	7A	12.0-14.0	3 - 2 - 2 - 2	4
15'		8A	14.0-16.0	6 - 6 - 8- 9	17
18.0'		9A	16.0-18.0	12-16-16-16	32
20'	(Original) Dense brown sand and gravel, trace of silt, trace of cobbles - moist	10A	18.0-20.0	21-33-26-18	44
		11A	23.0-25.0	14-14-16-16	32
25'	(Becomes wet at 26.7')				
		12A	28.0-30.0	13-28-21-16	37
30'	Bottom of Boring at 33.0'				

Method: Hollow Stem Auger

Technician: TA/SA

Job No. 46826

Water Observations

Initial Depth: 26.7

Completion Depth: 27.4'

Depth After: hrs.

Type Sampler

- [X] A. Split-Spoon
- [ ] B.
- [ ] C. Shelby Tube
- [ ] D.

APPENDIX C

ANALYTICAL DATA AND CHAIN OF CUSTODY RECORD

CHAIN OF CUSTOD' RECORD

SCS ANALYTICAL LABORATORY
2800 WALNUT AVENUE
LONG BEACH, CALIFORNIA 90806
(213) 595-4324

PERSONNEL

Sampler (Signature) James a O'Brien

Phone (606) 341-5353

Field Crew Supervisor Jim Stamm

Field Company SCS Engineers

Project Geologist/Engineer Jim Stamm

SITE INFORMATION

Job Name DE&C

Job Number 0590035

Sample Location monitoring wells on site

P.O. Number

Relinquished by (Signature)	Received by (Signature)	Date	Time
James a. O'Brien	C. M. Marshall	4/15/90	8:45am
Relinquished by (Signature)	Received by (Signature)	Date	Time

Analysis laboratory should complete "sample cond. upon receipt" section below, sign, and return copy to Shipper

Sample Number	Sample Type	No. of Cont.	Site Identification	Date Sampled	Analysis Requested	Sample Cond. Upon Receipt
MW 1	water	1	Monitoring well 1	4/15/90	TPH, BTEX	
MW 2			monitoring well 2			
MW 3			Monitoring well 3			

Remarks:

CHAIN OF CUSTODY RECORD

SCS ANALYTICAL LABORATORY
2860 WALNUT AVENUE
LONG BEACH, CALIFORNIA 90806
(213) 595-9324

PERSONNEL

Sampler (Signature) James A. O'Brien
Phone (606) 341-5353

Field Crew Supervisor Jim O'Brien
Field Company SCS Engineers
Project Geologist/Engineer Jim Stamm

SITE INFORMATION

Job Name DP&L
Job Number 0590005
Sample Location Monitoring wells on site

P.O. Number

Relinquished by (Signature)	Received by (Signature)	Date	Time
James A. O'Brien			
Relinquished by (Signature)	Received by (Signature)	Date	Time

Analysis laboratory should complete "sample cond. upon receipt" section below, sign, and return copy to Shipper

Sample Number	Sample Type	No. of Cont.	Site Identification	Date Sampled	Analysis Requested	Sample Cond. Upon Receipt
MW1	water	1	Monitoring well #1	4/2/90	BTEX 8240	
MW2			Monitoring well #2			
MW3			Monitoring well #3			

Remarks: Normal Turnaround Time

ED_001207_00000832

CHAIN OF CUSTOD[illegible] RECORD

SCS ANALYTICAL LABORATORY
2860 WALNUT AVENUE
LONG BEACH, CALIFORNIA 90806
(213) 595-9324

PERSONNEL

Sampler (Signature) James A. O'Brien
Phone (606) 341-5353

Field Crew Supervisor Jim O'Brien
Field Company SCS Engineers
Project Geologist/Engineer Jim Stamm

SITE INFORMATION

Job Name DP&L
Job Number 0590005.00
Sample Location Ground water wells on site

P.O. Number

Relinquished by (Signature)	Received by (Signature)	Date	Time
James A. O'Brien	[illegible]	5/11/90	
Relinquished by (Signature)	Received by (Signature) [illegible]	Date 5/11/90	Time 4:50 pm

Analysis laboratory should complete "sample cond. upon receipt" section below, sign, and return copy to Shipper

Sample Number	Sample Type	No. of Cont.	Site Identification	Date Sampled	Analysis Requested	Sample Cond. Upon Receipt
GW1-A	water	1	well #1	5/10/90	BTEX ~~602~~ 8020	
GW1-B			↓		TPH 418.1	
GW2-A			well #2		BTEX 8020	
GW2-B			↓		TPH 418.1	
GW3-A			well #3		BTEX 8020	
GW3-B			↓		TPH 418.1	
*GW1-Dup			well #1		BTEX 8020	
*GW2-Dup			well #2		BTEX 8020	
*GW3-Dup			well #3		BTEX 8020	
MW2-WA			Mon well #2		PAH	

Remarks: *Dup - only analyze if 1st is damaged. Normal turnaround time

ED_001207_00000832

CHAIN OF CUSTODY RECORD

SCS ANALYTICAL LABORATORY
2810 WALNUT AVENUE
LONG BEACH, CALIFORNIA 90806
(213) 595-9324

PERSONNEL

Sampler (Signature) James A. O'Brien

Phone (606) 341-5353

Field Crew Supervisor Jim O'Brien

Field Company SCS Engineers

Project Geologist/Engineer Jim Stamm

SITE INFORMATION

Job Name O P & L

Job Number 590005.00

Sample Location Monitoring wells on site

P.O. Number

Relinquished by (Signature)	Received by (Signature)	Date	Time
James A. O'Brien	[signature]	5-10-90	9:30
Relinquished by (Signature)	Received by (Signature)	Date	Time

Analysis laboratory should complete "sample cond. upon receipt" section below, sign, and return copy to Shipper

Sample Number	Sample Type	No. of Cont.	Site Identification	Date Sampled	Analysis Requested	Sample Cond. Upon Receipt
GW1-H	soil	1	Ground water well #1	5/7/90	BTEX 8020 TPH 418.1	
GW1-J	↓	↓	↓	↓	↓	
GW2-F	↓	↓	Ground water well #2	5/8/90	↓	
GW2-J	↓	↓	↓	↓	↓	
GW3-G	↓	↓	Ground water well #3	↓	↓	
GW3-J	↓	↓	↓	↓	↓	

Remarks: Normal Turnaround Time

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MAY 23, 1990

MR. JAMES O'BRIEN
SCS ENGINEERS
211 GRANDVIEW DRIVE, SUITE 206
FT. MITCHELL, KY 41017

CARDINAL PROJECT I.D.: 90578/4
DATE RECEIVED: 5-11-90
COLLECTION METHOD: GRAB
MATRIX: WATER

PROJECT NAME: D P & L
PROJECT NUMBER: 59005.00
PURCHASE ORDER NUMBER: VERBAL
SAMPLE I.D.: GW-1
DATE SAMPLED: 5-10-90 TIME: -
COLLECTED BY: J.A.O.

PARAMETERS	STANDARD METHOD	RESULTS	ANALYST
TOTAL PETROLEUM HYDROCARBONS	SW-846-9071 418.1 600/4.79.020	1820 mg/L	SGS 5/16
BENZENE	SW-846-8020	554 ug/L	MLM 5/23
TOLUENE	SW-846-8020	34 ug/L	MLM 5/23
ETHYL BENZENE	SW-846-8020	780 ug/L	MLM 5/23
XYLENE	SW-846-8020	19200 ug/L	MLM 5/23

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FT. MITCHELL, KY 41017

CARDINAL PROJECT I.D.: 90578/4
DATE RECEIVED: 5-11-90
COLLECTION METHOD: GRAB
MATRIX: WATER

PROJECT NAME: D P & L
PROJECT NUMBER: 59005.00
PURCHASE ORDER NUMBER: VERBAL
SAMPLE I.D.: GW-2
DATE SAMPLED: 5-10-90 TIME: -
COLLECTED BY: J.A.O.

PARAMETERS	STANDARD METHOD	RESULTS	ANALYST
TOTAL PETROLEUM	SW-846-9071		
HYDROCARBONS	418.1 600/4.79.020	6 mg/L	SGS 5/16
BENZENE	SW-846-8020	< 2 ug/L	MLM 5/23
TOLUENE	SW-846-8020	< 2 ug/L	MLM 5/23
ETHYL BENZENE	SW-846-8020	< 2 ug/L	MLM 5/23
XYLENE	SW-846-8020	< 2 ug/L	MLM 5/23

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FT. MITCHELL, KY 41017

CARDINAL PROJECT I.D.: 90578/4
DATE RECEIVED: 5-11-90
COLLECTION METHOD: GRAB
MATRIX: WATER

PROJECT NAME: D P & L
PROJECT NUMBER: 59005.00
PURCHASE ORDER NUMBER: VERBAL
SAMPLE I.D.: GW-3
DATE SAMPLED: 5-10-90 TIME: -
COLLECTED BY: J.A.O.

PARAMETERS	STANDARD METHOD	RESULTS	ANALYST
TOTAL PETROLEUM HYDROCARBONS	SW-846-9071 418.1 600/4.79.020	< 1 mg/L	SGS 5/16
BENZENE	SW-846-8020	< 2 ug/L	MLM 5/23
TOLUENE	SW-846-8020	< 2 ug/L	MLM 5/23
ETHYL BENZENE	SW-846-8020	< 2 ug/L	MLM 5/23
XYLENE	SW-846-8020	< 2 ug/L	MLM 5/23

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MAY 2, 1990

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SCS ENGINEERS
211 GRANDVIEW DRIVE, STE 206
FT. MITCHELL, KY 41017

CARDINAL PROJECT I.D.: 90320/3
DATE RECEIVED: 4-19-90
COLLECTION METHOD: GRAB
MATRIX: WATER

PROJECT NAME: D P & L
PROJECT NUMBER: 0590005
PURCHASE ORDER NUMBER: VERBAL J.S.
SAMPLE I.D.: MW-1
DATE SAMPLED: 4-18-90 TIME: -
COLLECTED BY: J.D.

PARAMETERS	STANDARD METHOD	RESULTS	ANALYST
TOTAL PETROLEUM HYDROCARBONS	SW-846-9071 418.1 600/4.79.020	45.2 mg/L	ACM 4/27
BENZENE	SW-846-8020	< 5 ug/L	MLM 5/02
TOLUENE	SW-846-8020	< 5 ug/L	MLM 5/02
ETHYL BENZENE	SW-846-8020	4040 ug/L	MLM 5/02
XYLENE	SW-846-8020	19200 ug/L	MLM 5/02

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CARDINAL PROJECT I.D.: 90320/3
DATE RECEIVED: 4-19-90
COLLECTION METHOD: GRAB
MATRIX: WATER

PROJECT NAME: D P & L
PROJECT NUMBER: 0590005
PURCHASE ORDER NUMBER: VERBAL J.S.
SAMPLE I.D.: MW-2
DATE SAMPLED: 4-18-90 TIME: -
COLLECTED BY: J.O.

PARAMETERS	STANDARD METHOD	RESULTS	ANALYST
TOTAL PETROLEUM	SW-846-9071		
HYDROCARBONS	418.1 600/4.79.020	57.5 mg/L	ACM 4/27
BENZENE	SW-846-8020	< 5 ug/L	MLM 5/02
TOLUENE	SW-846-8020	< 5 ug/L	MLM 5/02
ETHYL BENZENE	SW-846-8020	< 5 ug/L	MLM 5/02
XYLENE	SW-846-8020	< 5 ug/L	MLM 5/02

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CARDINAL PROJECT I.D.: 90320/3
DATE RECEIVED: 4-19-90
COLLECTION METHOD: GRAB
MATRIX: WATER

PROJECT NAME: D P & L
PROJECT NUMBER: 0590005
PURCHASE ORDER NUMBER: VERBAL J.S.
SAMPLE I.D.: MW-3
DATE SAMPLED: 4-18-90 TIME: -
COLLECTED BY: J.D.

PARAMETERS	STANDARD METHOD	RESULTS		ANALYST
TOTAL PETROLEUM	SW-846-9071			
HYDROCARBONS	418.1 600/4.79.020	< 1	mg/L	ACM 4/27
BENZENE	SW-846-8020	< 5	ug/L	MLM 5/02
TOLUENE	SW-846-8020	< 5	ug/L	MLM 5/02
ETHYL BENZENE	SW-846-8020	< 5	ug/L	MLM 5/02
XYLENE	SW-846-8020	< 5	ug/L	MLM 5/02

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CARDINAL PROJECT I.D.: 90369/6
DATE RECEIVED: 5-10-90
COLLECTION METHOD: GRAB
MATRIX: SOIL

PROJECT NAME: D P & L
PROJECT NUMBER: 590005.00
PURCHASE ORDER NUMBER: VERBAL
SAMPLE I.D.: GW 1-H
DATE SAMPLED: 5-07-90 TIME: -
COLLECTED BY: J.O.

PARAMETERS	STANDARD METHOD	RESULTS	ANALYST
TOTAL PETROLEUM HYDROCARBONS	SW-846-9071 418.1 600/4.79.020	80 mg/kg	SGS 5/11
BENZENE	SW-846-8020	< 5 ug/kg	MLM 5/22
TOLUENE	SW-846-8020	< 5 ug/kg	MLM 5/22
ETHYL BENZENE	SW-846-8020	< 5 ug/kg	MLM 5/22
XYLENE	SW-846-8020	< 5 ug/kg	MLM 5/22

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CARDINAL PROJECT I.D.: 90369/6
DATE RECEIVED: 5-10-90
COLLECTION METHOD: GRAB
MATRIX: SOIL

PROJECT NAME: D P & L
PROJECT NUMBER: 590005.00
PURCHASE ORDER NUMBER: VERBAL
SAMPLE I.D.: GW 1-J
DATE SAMPLED: 5-07-90 TIME: -
COLLECTED BY: J.O.

PARAMETERS	STANDARD METHOD	RESULTS	ANALYST
TOTAL PETROLEUM HYDROCARBONS	SW-846-9071 418.1 600/4.79.020	13100 mg/kg	SGS 5/11
BENZENE	SW-846-8020	< 5 ug/kg	MLM 5/22
TOLUENE	SW-846-8020	< 5 ug/kg	MLM 5/22
ETHYL BENZENE	SW-846-8020	206 ug/kg	MLM 5/22
XYLENE	SW-846-8020	309 ug/kg	MLM 5/22

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CARDINAL PROJECT I.D.: 90369/6
DATE RECEIVED: 5-10-90
COLLECTION METHOD: GRAB
MATRIX: SOIL

PROJECT NAME: D P & L
PROJECT NUMBER: 590005.00
PURCHASE ORDER NUMBER: VERBAL
SAMPLE I.D.: GW 2-F
DATE SAMPLED: 5-08-90 TIME: -
COLLECTED BY: J.O.

PARAMETERS	STANDARD METHOD	RESULTS	ANALYST
TOTAL PETROLEUM HYDROCARBONS	SW-846-9071 418.1 600/4.79.020	47 mg/kg	SGS 5/11
BENZENE	SW-846-8020	< 5 ug/kg	MLM 5/22
TOLUENE	SW-846-8020	< 5 ug/kg	MLM 5/22
ETHYL BENZENE	SW-846-8020	< 5 ug/kg	MLM 5/22
XYLENE	SW-846-8020	< 5 ug/kg	MLM 5/22

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CARDINAL PROJECT I.D.: 90369/6
DATE RECEIVED: 5-10-90
COLLECTION METHOD: GRAB
MATRIX: SOIL

PROJECT NAME: D P & L
PROJECT NUMBER: 590005.00
PURCHASE ORDER NUMBER: VERBAL
SAMPLE I.D.: GW 2-J
DATE SAMPLED: 5-08-90 TIME: -
COLLECTED BY: J.O.

PARAMETERS	STANDARD METHOD	RESULTS	ANALYST
TOTAL PETROLEUM HYDROCARBONS	SW-846-9071 418.1 600/4.79.020	202 mg/kg	SGS 5/11
BENZENE	SW-846-8020	< 5 ug/kg	MLM 5/22
TOLUENE	SW-846-8020	< 5 ug/kg	MLM 5/22
ETHYL BENZENE	SW-846-8020	< 5 ug/kg	MLM 5/22
XYLENE	SW-846-8020	< 5 ug/kg	MLM 5/22

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CARDINAL PROJECT I.D.: 90369/6
DATE RECEIVED: 5-10-90
COLLECTION METHOD: GRAB
MATRIX: SOIL

PROJECT NAME: D P & L
PROJECT NUMBER: 590005.00
PURCHASE ORDER NUMBER: VERBAL
SAMPLE I.D.: GW 3-G
DATE SAMPLED: 5-08-90 TIME: -
COLLECTED BY: J.O.

PARAMETERS	STANDARD METHOD	RESULTS	ANALYST
TOTAL PETROLEUM HYDROCARBONS	SW-846-9071 418.1 600/4.79.020	10500 mg/kg	SGS 5/11
BENZENE	SW-846-8020	< 5 ug/kg	MLM 5/22
TOLUENE	SW-846-8020	< 5 ug/kg	MLM 5/22
ETHYL BENZENE	SW-846-8020	< 5 ug/kg	MLM 5/22
XYLENE	SW-846-8020	< 5 ug/kg	MLM 5/22

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59005 Lab Data

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CARDINAL PROJECT I.D.: 90369/6
DATE RECEIVED: 5-10-90
COLLECTION METHOD: GRAB
MATRIX: SOIL

PROJECT NAME: D P & L
PROJECT NUMBER: 590005.00
PURCHASE ORDER NUMBER: VERBAL
SAMPLE I.D.: GW 3-J
DATE SAMPLED: 5-08-90 TIME: -
COLLECTED BY: J.D.

PARAMETERS	STANDARD METHOD	RESULTS	ANALYST
TOTAL PETROLEUM HYDROCARBONS	SW-846-9071 418.1 600/4.79.020	20 mg/kg	SGS 5/11
BENZENE	SW-846-8020	< 5 ug/kg	MLM 5/22
TOLUENE	SW-846-8020	< 5 ug/kg	MLM 5/22
ETHYL BENZENE	SW-846-8020	< 5 ug/kg	MLM 5/22
XYLENE	SW-846-8020	< 5 ug/kg	MLM 5/22

Antoinette Marshall

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APPENDIX D

SLUG TEST RESULTS

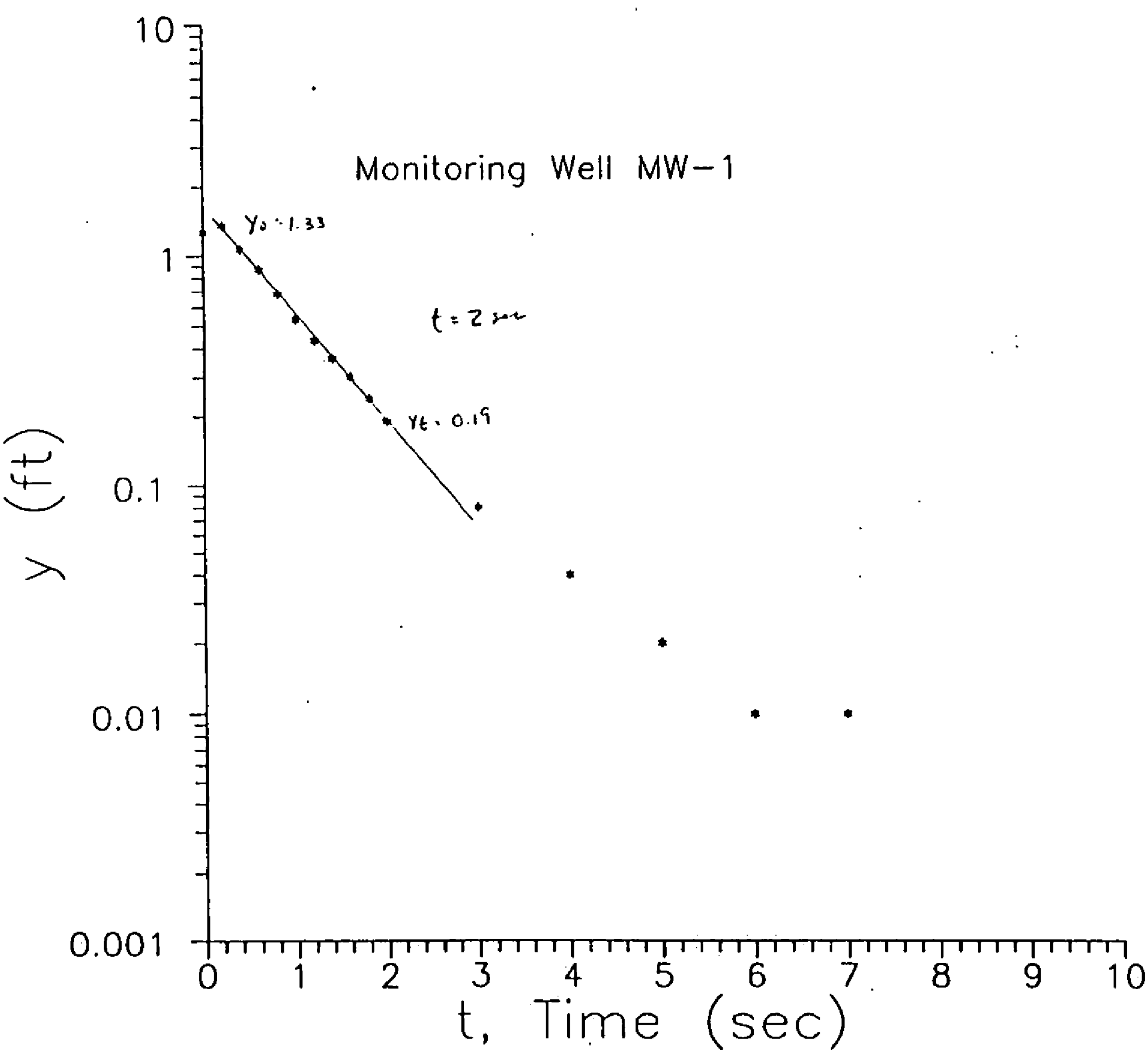
Slug Test Data, Hydraulic Conductivity, and Transmissivity at Dayton Power and Light, Dayton, Ohio

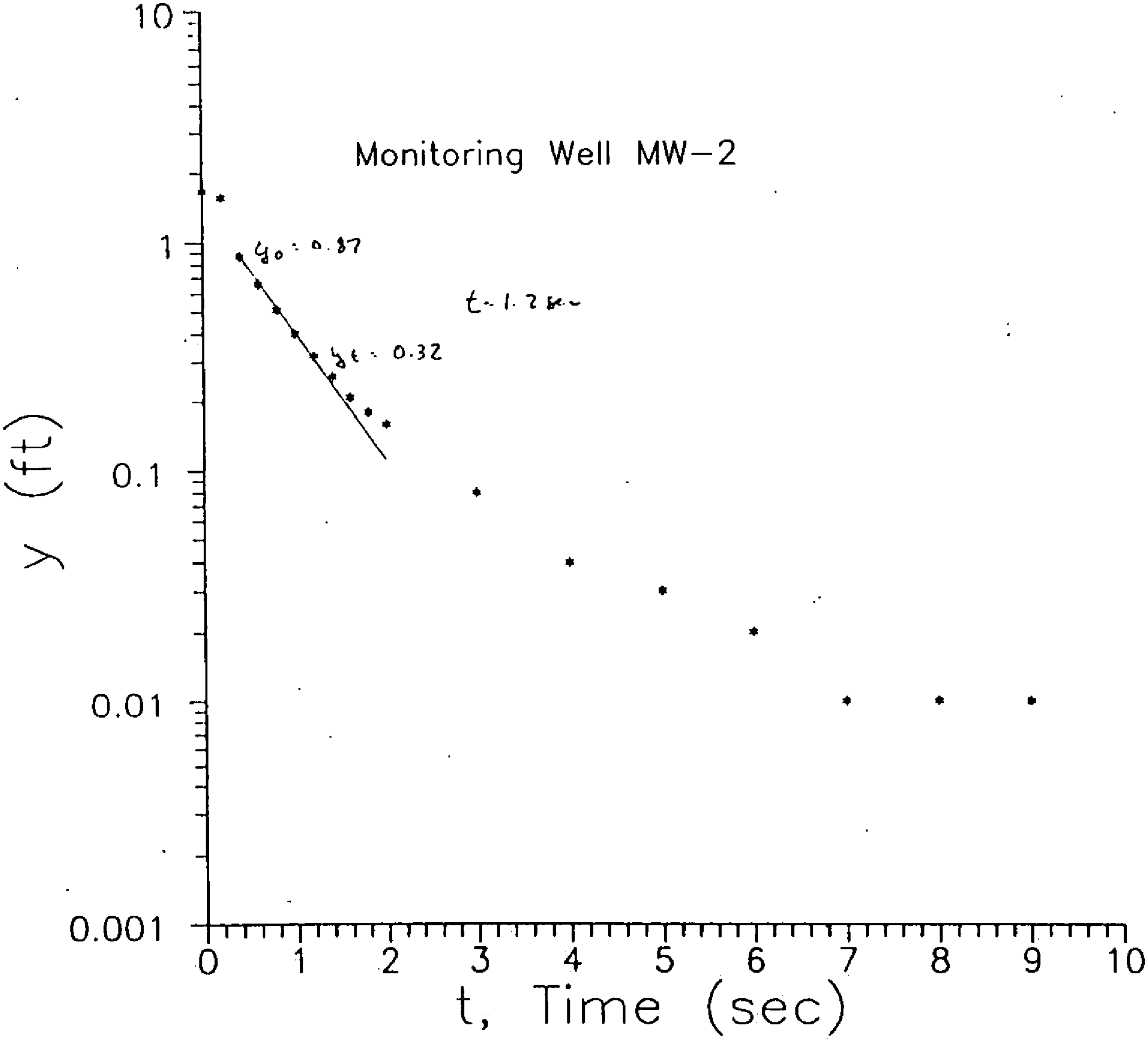
Well	Depth to GW from Top of Well Prot. (ft)	Well Protector Height (ft)	Depth to GW from Ground Surface (ft)	Top of Screen from grd. Surface (ft)	Bottom of Screen from grd. surface (ft)	L (ft)	rw (ft)	L/rw	A	B	Depth to Imp. Bedrock (ft)	Depth to Bedrock (ft)	D (ft)	H (ft)	ln (Re/rw)	rc (ft)	y0 (ft)	yt (ft)	t (sec)
input	input	input	calc	input	input	input	input	calc	input	input	input	input	calc	calc	calc	input	input	input	input
MW-1	24.50	-0.59	25.09	24.40	34.40	9.31	0.25	37	2.51	0.47	300		274.9	9.31	1.483	0.083	1.33	0.19	2.0
MW-2	24.65	-0.33	24.98	25.60	35.60	10.62	0.25	42	2.45	0.42	300		275	10.62	1.700	0.083	0.87	0.32	1
MW-3	25.10	0.10	25.00	20.00	30.00	5.00	0.25	20	2.10	0.28	300		275	5.00	1.237	0.083	1.58	0.04	20.0
GW-1	24.58	-0.25	24.83	20.00	30.00	5.17	0.25	21	2.01	0.28	300		275.2	5.17	1.273	0.083	0.28	0.02	1.2
GW-2	25.09	-0.25	25.34	20.50	30.50	5.16	0.25	21	2.01	0.28	300		274.7	5.16	1.272	0.083	0.59	0.14	2.6
GW-3	25.10	-0.25	25.35	22.00	32.00	6.65	0.25	27	2.50	0.35	300		274.7	6.65	1.342	0.083	1.77	0.27	1.8

Reference: Bouwer, H. and Rice, A Slug Test for Determining Hydraulic Conductivity for Unconfined Aquifers with Completely or Partially Penetrating Wells, Water Resources Research, Vol. 12, No. 3, June 1976

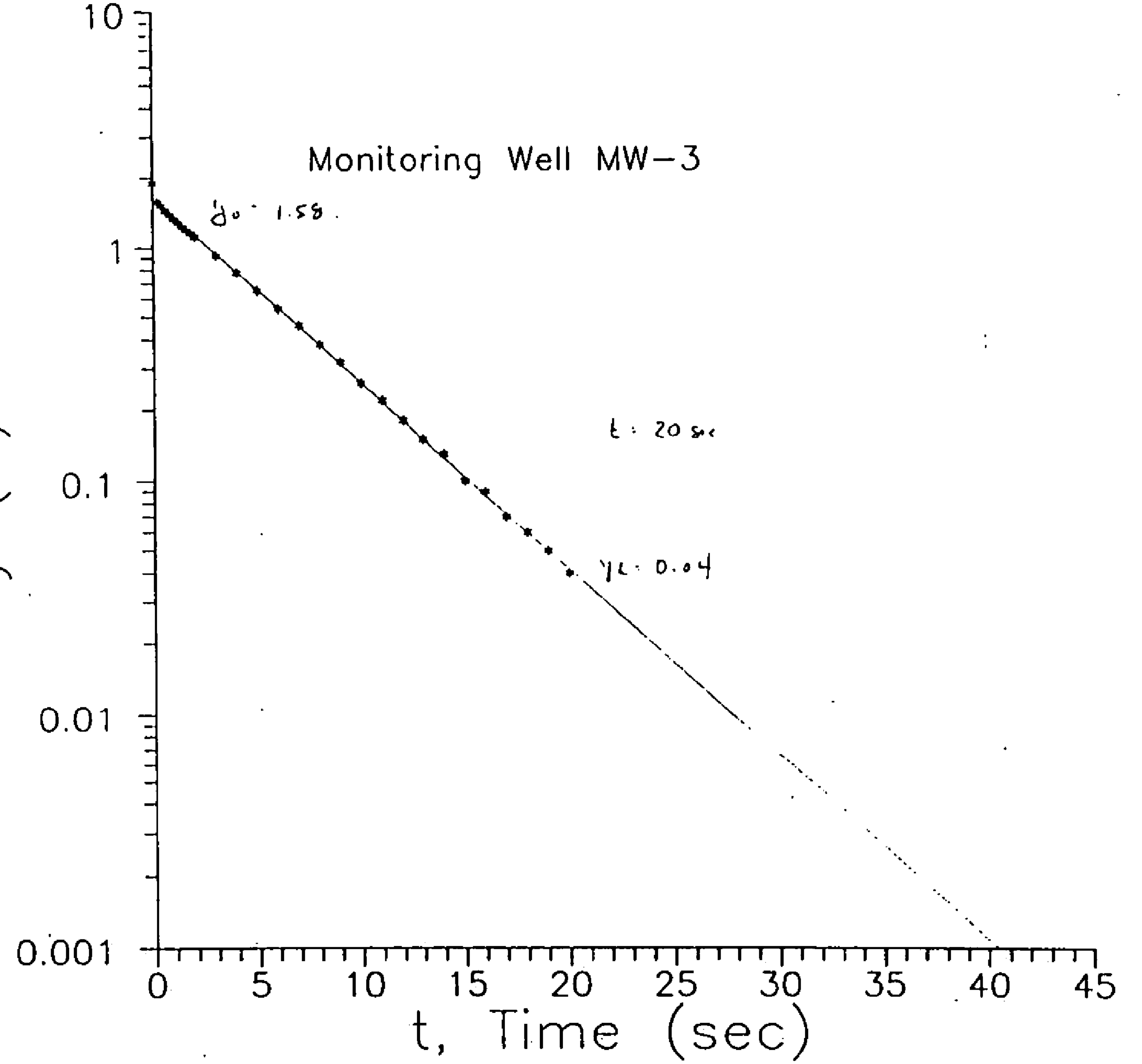
Slug Test Data, Hydraulic Conductivity, and Transmissivity at Dayton Power and Light, Dayton, Ohio

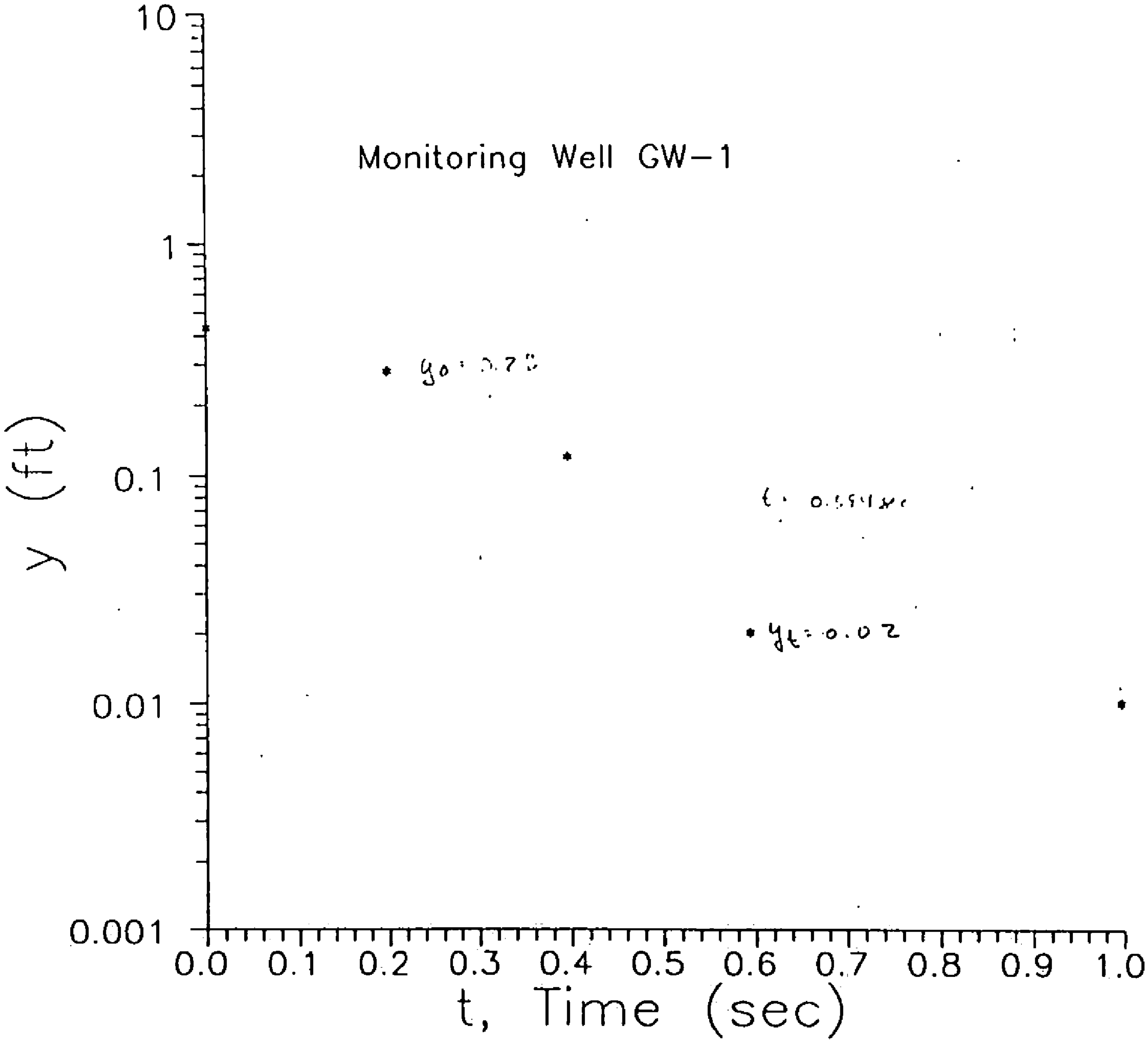
Well	K (ft/sec)	T (ft2/sec)	ln (H/rw)	ln [(D-H)/rw] (calculated)	ln [(D-H)/rw] (used in calcs)	K (m/sec)	K (cm/sec)	K (ft/day)
input	calc	calc	calc	calc	calc	calc	calc	calc
MW-1	5.3E-04	1.5E-01	3.62	6.97	6.00	1.6E-04	1.6E-02	46.12
MW-2	4.6E-04	1.3E-01	3.75	6.96	6.00	1.4E-04	1.4E-02	39.70
MW-3	1.6E-04	4.3E-02	3.00	6.98	6.00	4.8E-05	4.8E-03	13.54
GW-1	1.9E-03	5.1E-01	3.03	6.98	6.00	5.7E-04	5.7E-02	161.21
GW-2	4.7E-04	1.3E-01	3.03	6.98	6.00	1.4E-04	1.4E-02	40.58
GW-3	7.3E-04	2.0E-01	3.28	6.98	6.00	2.2E-04	2.2E-02	63.45

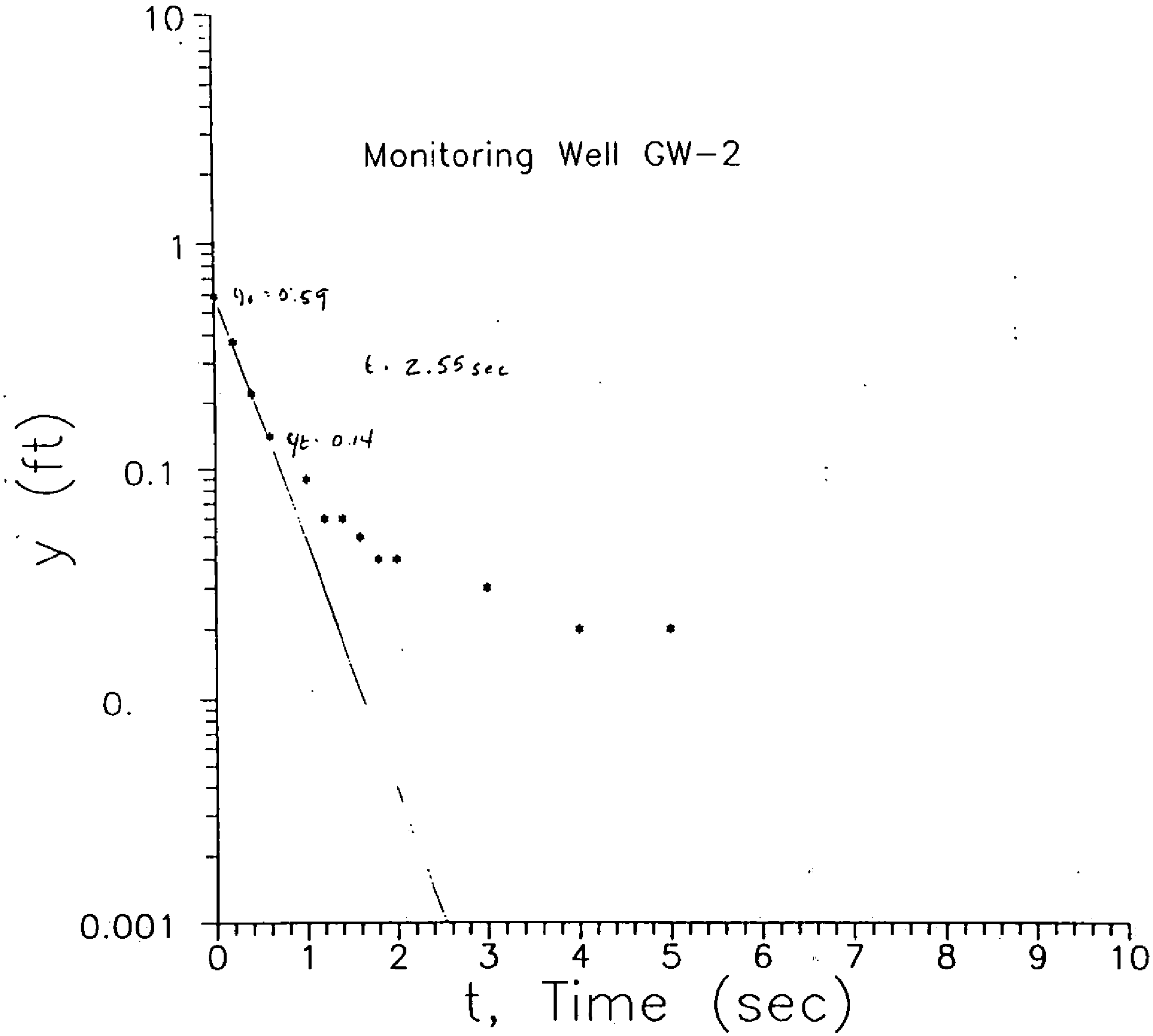

Monitoring Well MW-1
y_0 = 1.33
t = 2 sec
y_t = 0.19
10
1
0.1
0.01
0.001
y (ft)
0
1
2
3
4
5
6
7
8
9
10
t, Time (sec)

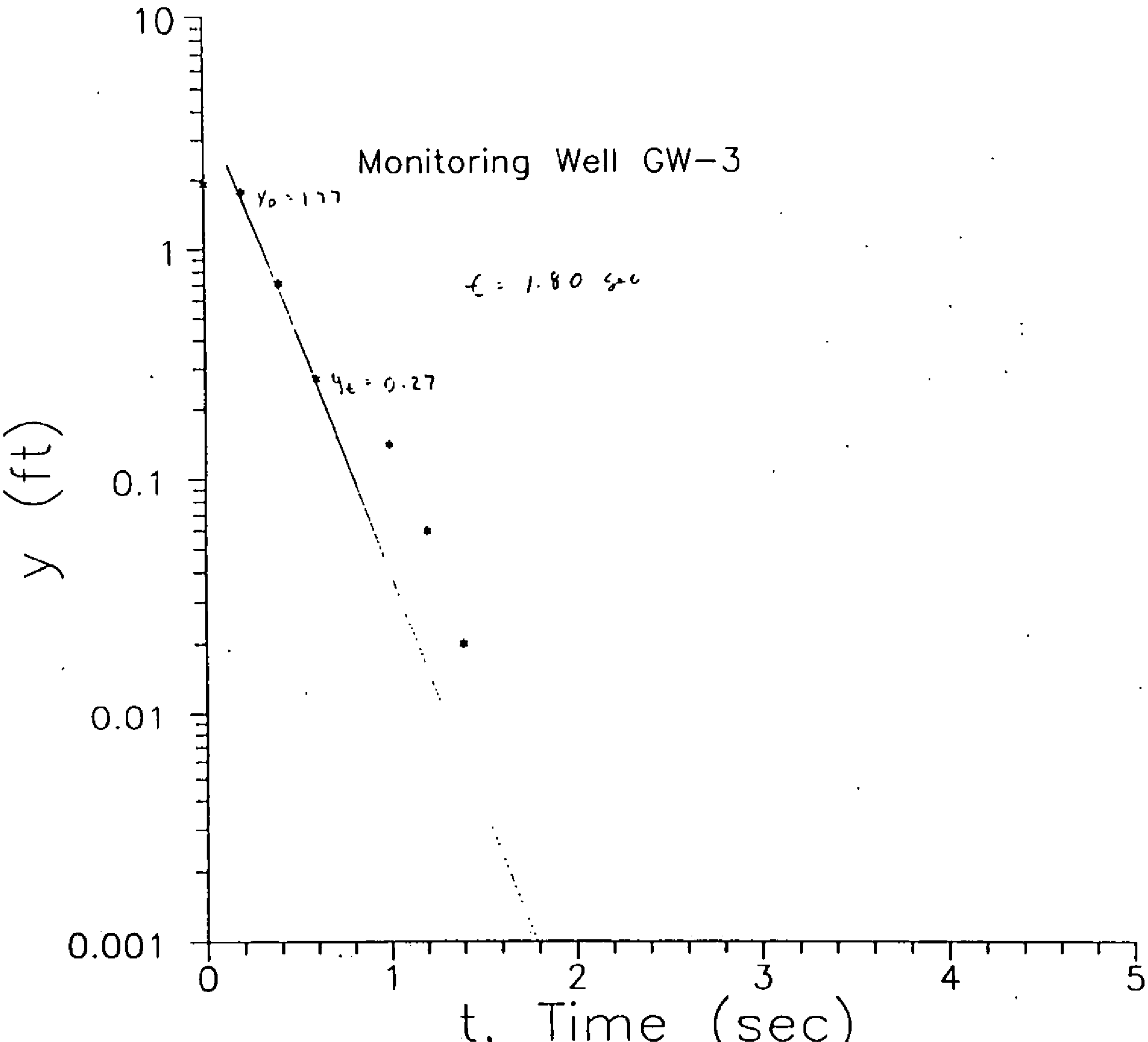


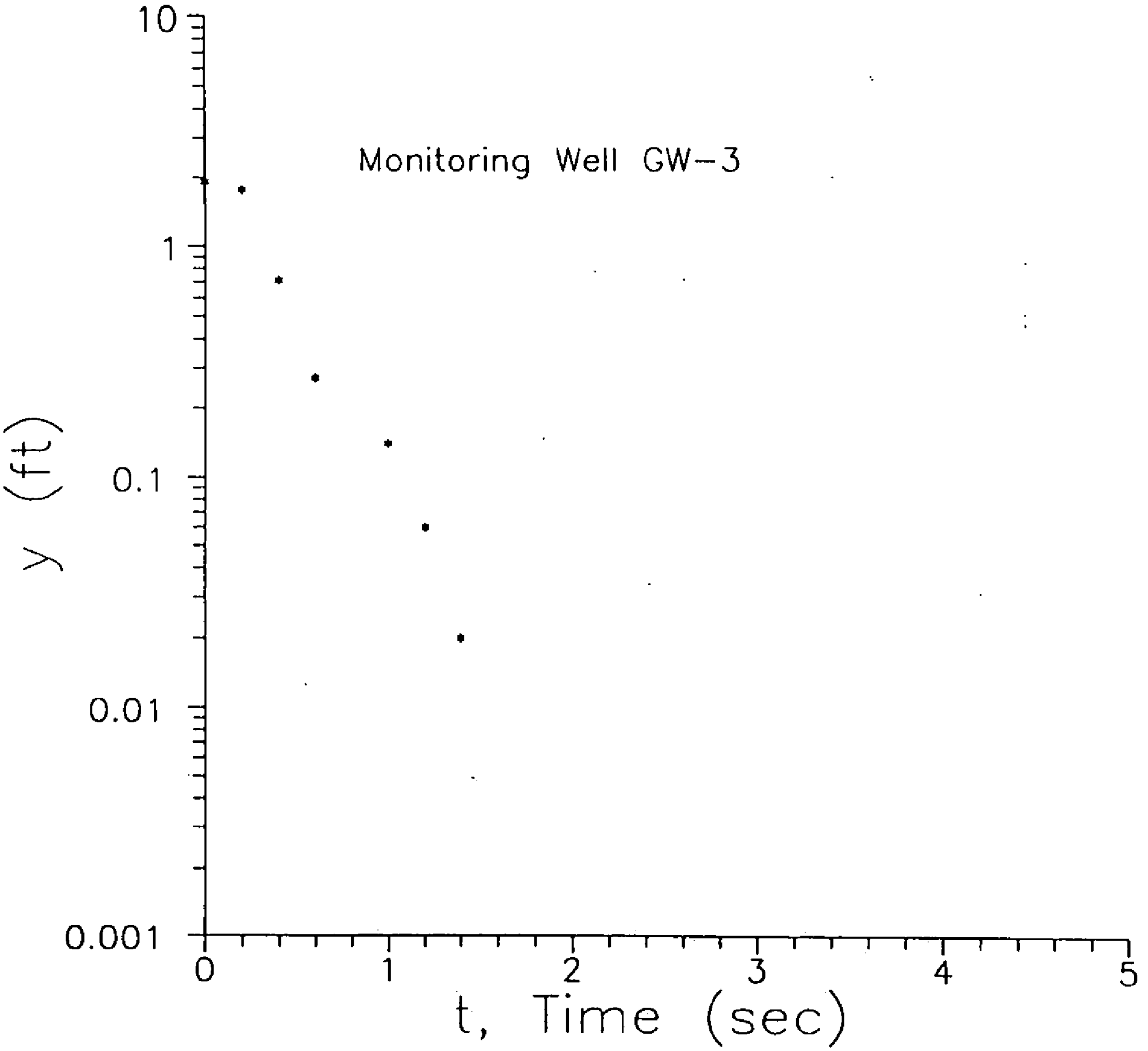
ED_001207_00000832

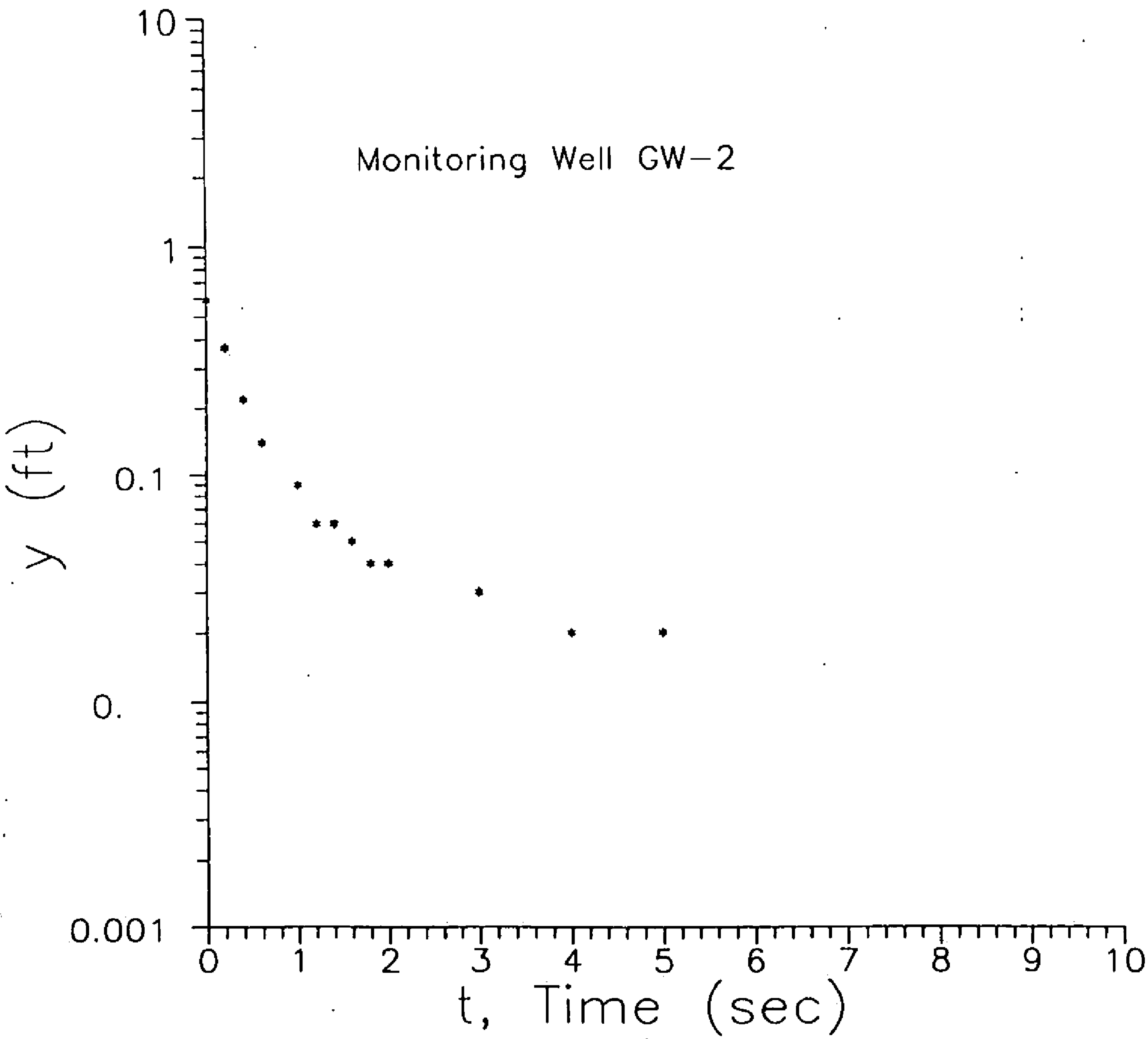

Monitoring Well MW-3
y₀ = 1.58
t = 20 sec
yₜ = 0.04
10
1
0.1
0.01
0.001
y (ft)
0 5 10 15 20 25 30 35 40 45
t, Time (sec)

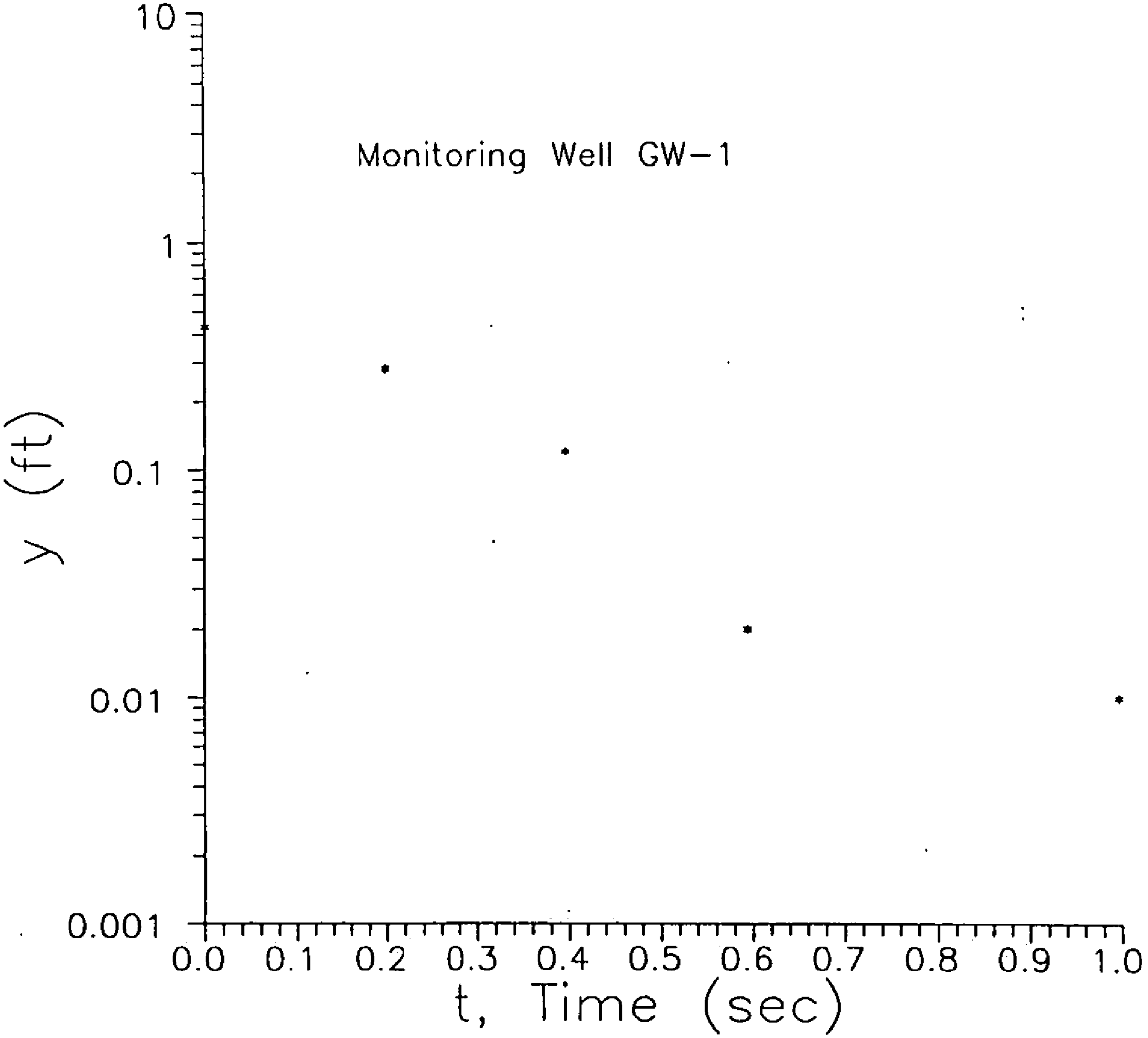

Monitoring Well GW-1
y (ft)
10
1
0.1
0.01
0.001
t, Time (sec)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
yt=0.02

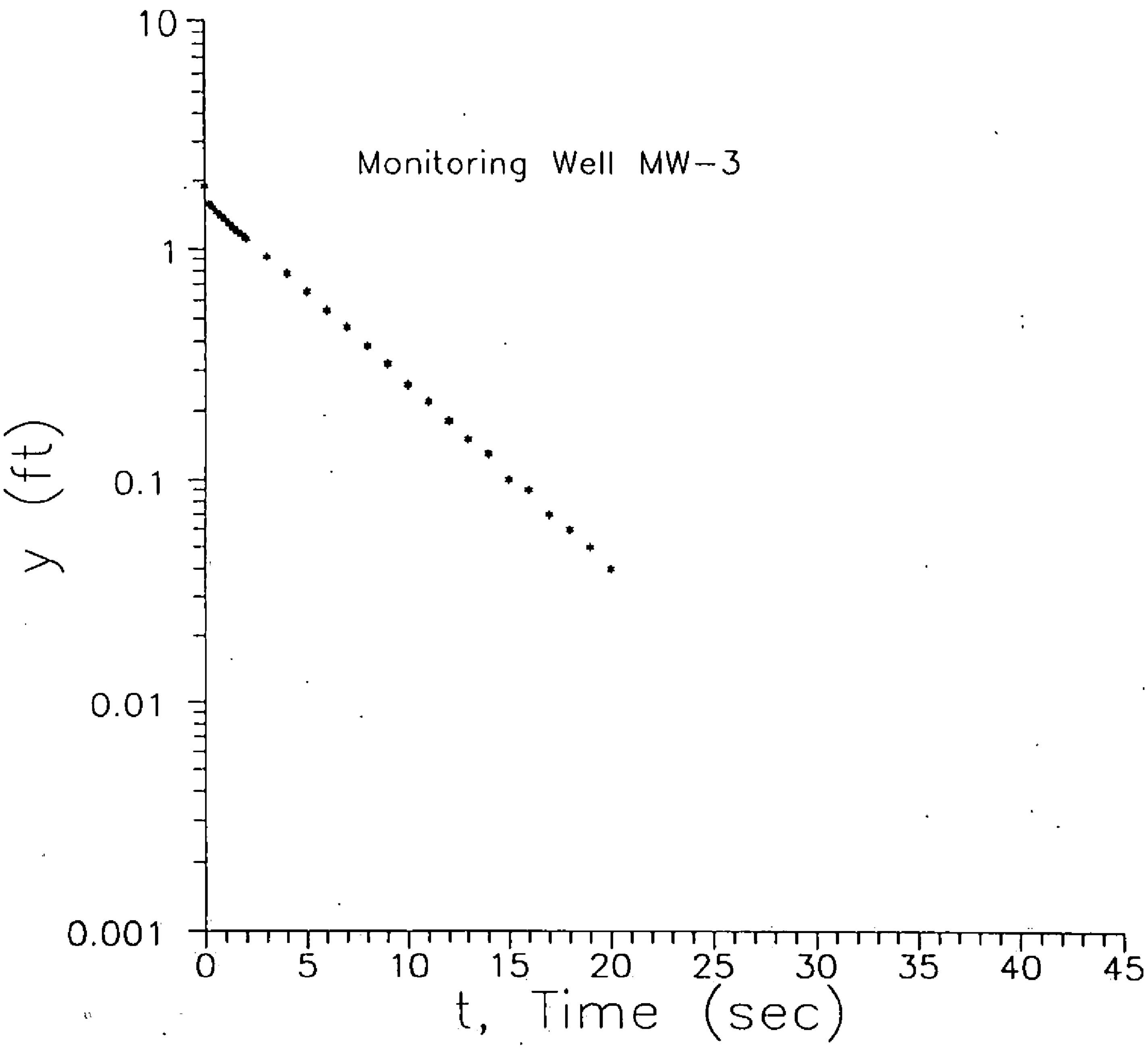

Monitoring Well GW-2
$y_0 = 0.59$
$t = 2.55$ sec
$y_t = 0.14$
10
1
0.1
0.
0.001
y (ft)
0
1
2
3
4
5
6
7
8
9
10
t, Time (sec)

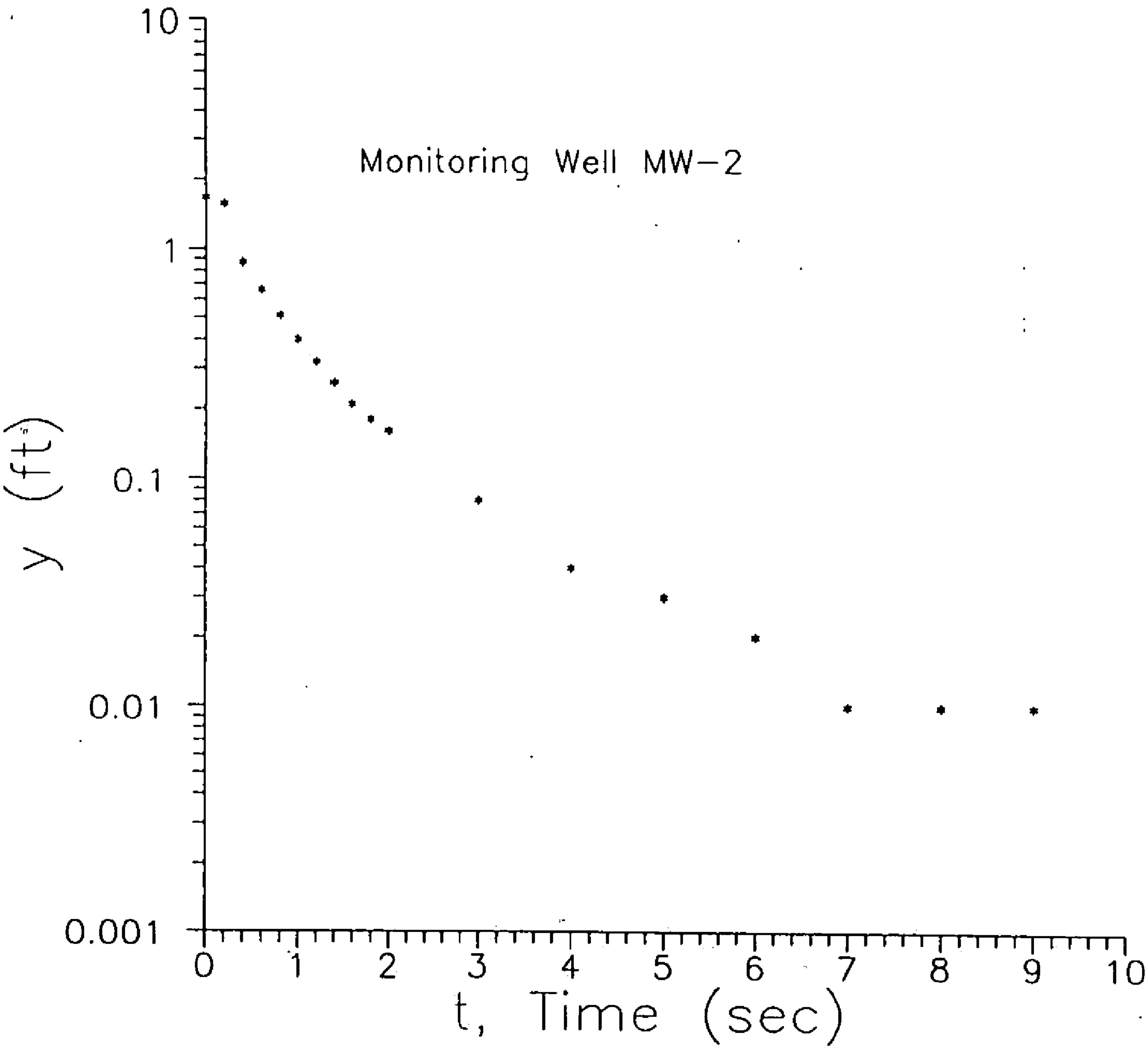

Monitoring Well GW-3
$y_0 = 1.77$
$t = 1.80$ sec
$y_t = 0.27$
10
1
0.1
0.01
0.001
y (ft)
0
1
2
3
4
5
t, Time (sec)

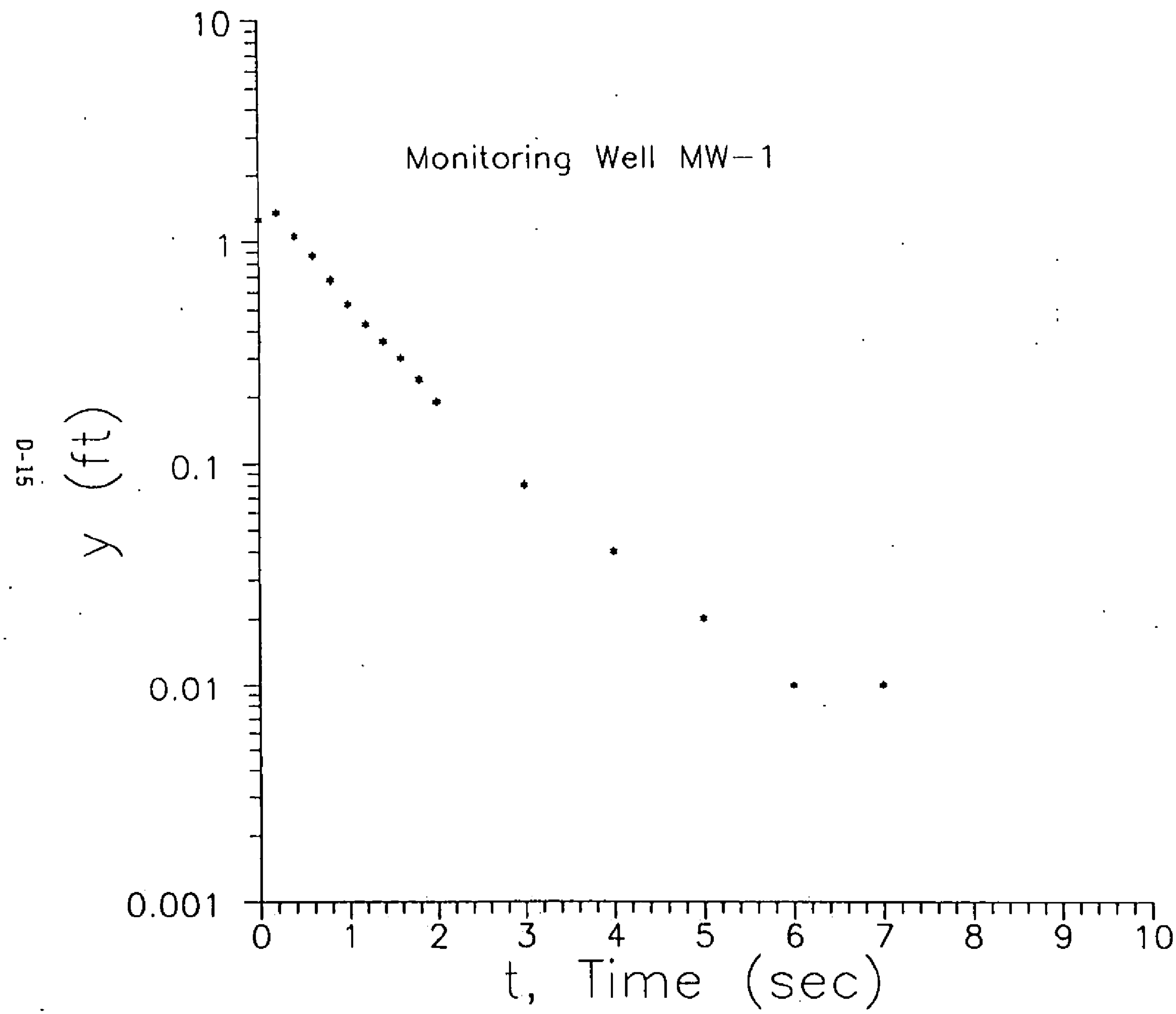

Monitoring Well GW-3
10
1
0.1
0.01
0.001
y (ft)
0
1
2
3
4
5
t, Time (sec)


Monitoring Well GW-2
10
1
0.1
0.
0.001
y (ft)
0
1
2
3
4
5
6
7
8
9
10
t, Time (sec)


Monitoring Well GW-1
y (ft)
10
1
0.1
0.01
0.001
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
t, Time (sec)


Monitoring Well MW-3
y (ft)
10
1
0.1
0.01
0.001
0
5
10
15
20
25
30
35
40
45
t, Time (sec)

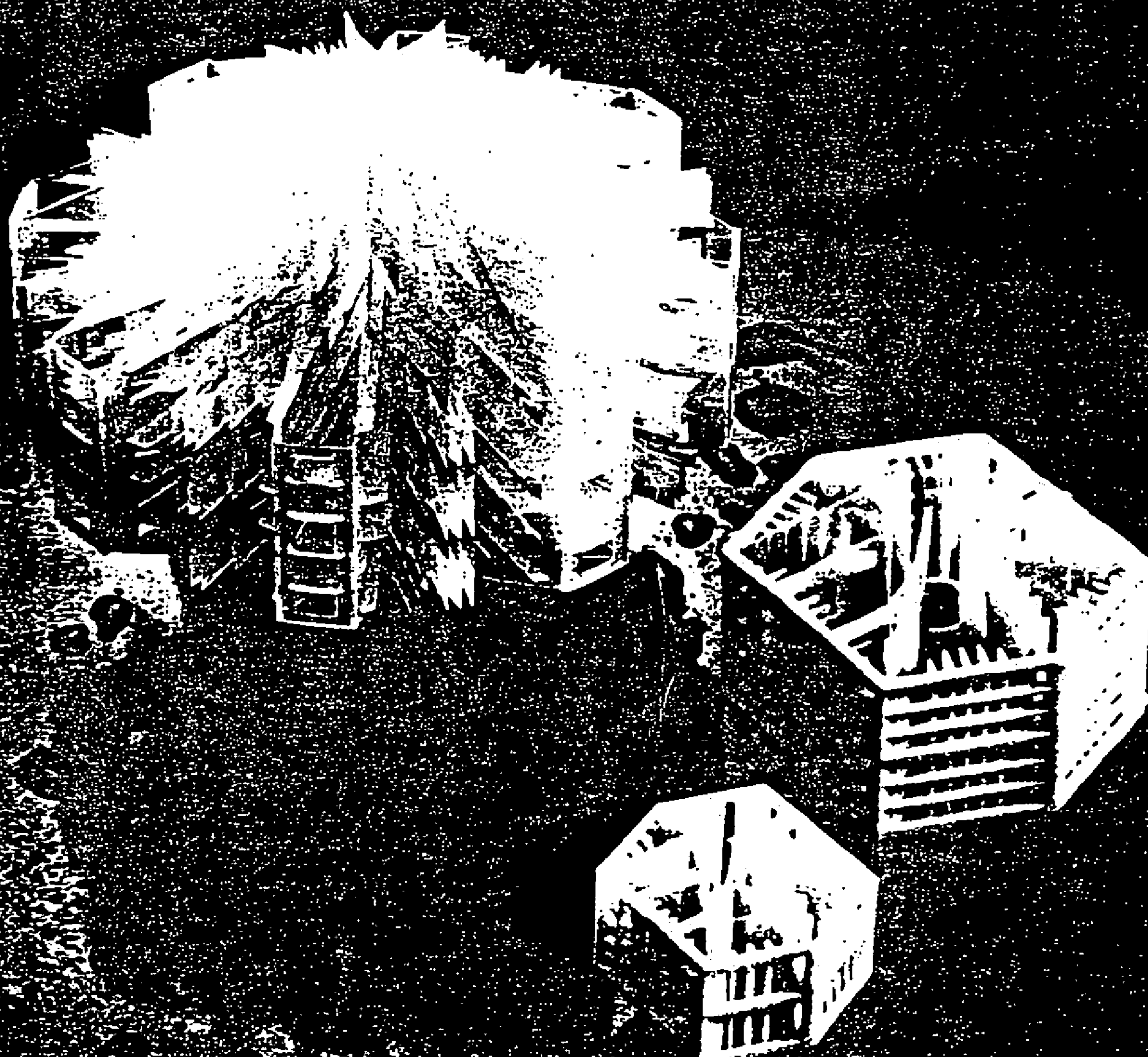

Monitoring Well MW-2
10
1
0.1
0.01
0.001
y (ft)
0
1
2
3
4
5
6
7
8
9
10
t, Time (sec)


Monitoring Well MW-1
10
1
0.1
0.01
0.001
0
1
2
3
4
5
6
7
8
9
10
t, Time (sec)
y (ft)
D-15

APPENDIX E

MANUFACTURERS LITERATURE FOR
STRIPPING COLUMN MEDIA

Tower Packing Technology Breakthrough From LANTEC!



Delivering Tomorrow's Packing Technology Today!

IMPAC™

Unique Tower Packing Improves Pressure Drop and Mass-Transfer Efficiencies Up to 300%!

IMPAC* tower packing, developed by Lantec Products, introduces a new methodology to the design and manufacture of packing materials which provides — FOR THE FIRST TIME — total control of packing geometry.

Major benefits of this breakthrough technology include:

- Improvement in packing efficiencies from 50% to 300%, compared to existing technologies!
- Significantly lower pressure drops!
- Packing factor to surface area ratio is considerably lower than all other dumped packings! (See chart below.)
- Unmatched mass-transfer capabilities!
- Substantial reduction in packing costs!

With traditional packing designs, the surface area per cubic foot goes up or down in a fixed ratio as the packing size is reduced or increased. With the introduction of IMPAC's patented manufacturing methodology, the size of the packing and the surface area per cubic foot are now two independent variables. IMPAC can be produced with a larger or smaller diameter featuring more or less surface area to meet a unique set of packed tower specifications.

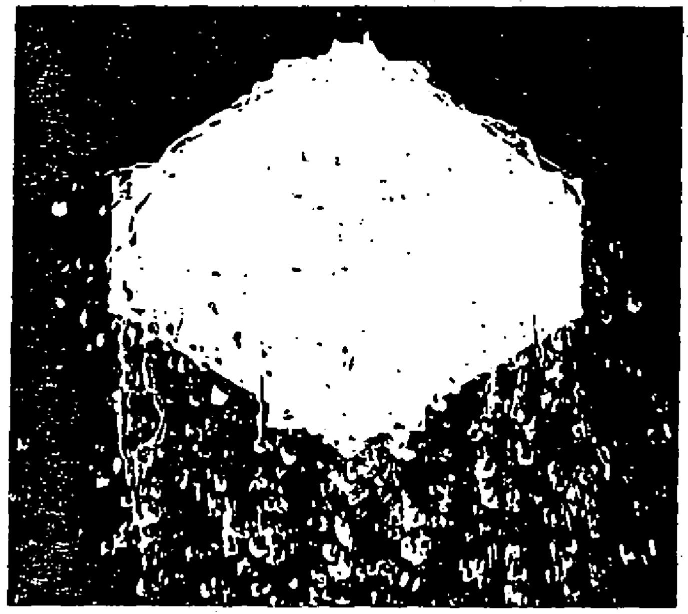
For example, a 5.5-inch, nominal-size IMPAC can be produced with a 50, 100, or even 200 sq. ft. surface area in a one cu. ft. space. Instead of buying 1500 pieces of one-inch or smaller traditional size packing to generate a certain surface area, you may only need as few as five IMPAC units. The results are dramatic: since these larger units can be produced much more economically, it costs significantly less to generate any required surface area with IMPAC.

Also due to its unique geometry, IMPAC gives you a dramatic reduction in pressure drop and a significant improvement in mass transfer efficiencies for a given surface area. Other IMPAC features include:

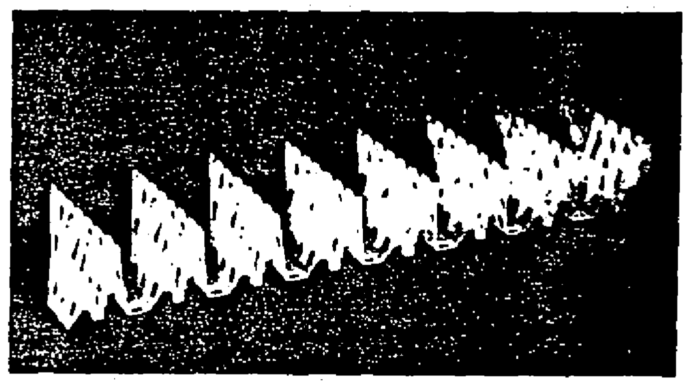
- Uniform distribution of surface elements throughout the packing structure.
- Even distribution of gas or liquid flow (see photo at upper right).
- As many as 50,000 drip points per cu. ft.
- Enhanced surface wetability.
- Total elimination of interlocking and nesting.
- Standard sizes ranging from 3.3" to 9.5" (dia.)

CONTACT LANTEC FOR TEST DATA AND DETAILED SPECIFICATIONS

U.S. Patent #4,724,593; worldwide patents pending.



Uniform distribution of gases or liquids through IMPAC is dramatized by this unretouched photo. We invite you to try this water test with any packing material you are currently using in your towers.

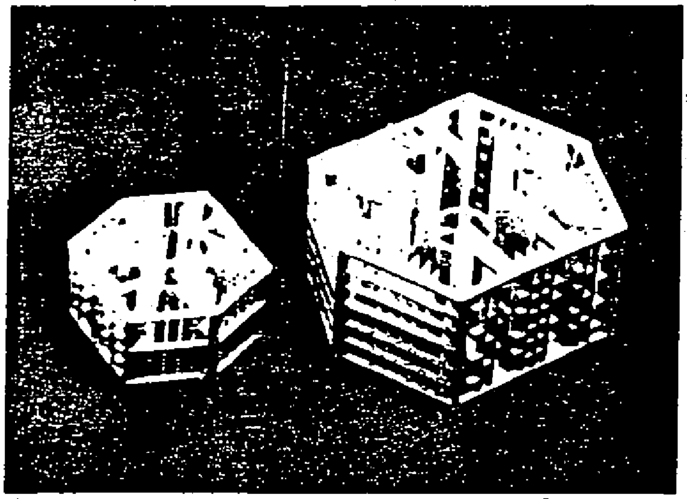


Unique geometry of IMPAC — featuring intricate networks of ribs, filaments, rods, struts, and pointed fingers to maximize the number of drip points — is revealed in this photo of a unit prior to assembly.

"PACKING FACTOR/SURFACE AREA" RATIO OF IMPAC™ VERSUS OTHER PLASTIC PACKINGS

Packing	Packing Factor/ (1/ft.)	Surface Area (ft²/cu. ft.)	Packing Factor/ Surface Area
#3 IMPAC™	15	65	0.23
#5 IMPAC™	6	33	0.18
3.5" LANPAC®	14	45	0.318
2" Size TriPacks®	18	48	0.375
3.5" Size TriPacks®	12	32	0.375
1" Pall Rings®	52	67	0.776
2" Pall Rings®	25	33	0.757
3" Pall Rings®	16	21	0.762
#2R-Tellerettes®	16	38	0.42
#2K-Tellerettes®	12	28	0.428

Proven LANPAC — Ideal for Scrubbing, Absorption, Air Stripping, Etc. — Reduces Costs Up to 60%

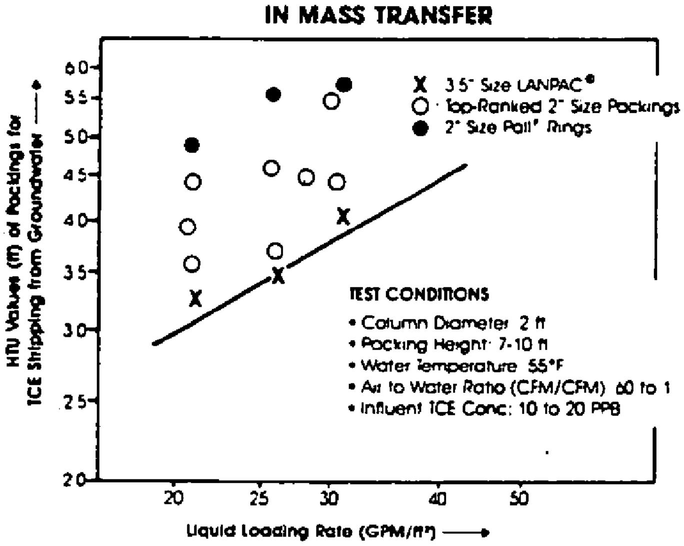


LANPAC is available in two sizes (2.3" and 3.5"). Test data demonstrate that this proven product is from 10% to 50% more efficient than competitive 2" packings, and reduces packing costs up to 60%.

SOME FIELD PERFORMANCE DATA OF 3.5" LANPAC FOR ABSORPTION SYSTEMS

Absorption System	Gas Loading Rate (lbs/hr/ft²)	Liquid Loading Rate (lbs/hr/ft²)	Temp. °F	Height of Transfer Unit (ft)
$H_2S/NaOH$	2,200	5,000	72	1.47
NH_3/H_2O	2,057	4,285	60	1.28
NH_3/H_2O	965	7,145	60	0.78
NH_3/H_2SO_4	2,200	1,090	68	1.02
NH_3/H_2SO_4	1,800	4,360	68	0.6
$HF/NaOH$	2,250	2,500	78	0.58
$Cl_2/NaOH$	1,350	5,000	68	1.42

3.5" LANPAC VS. TOP-RANKED 2" PACKINGS IN MASS TRANSFER



LANPAC* packing is similar to IMPAC in the broad sense that it achieves significantly lower pressure drops and higher mass transfer efficiencies than other packings smaller in size. While LANPAC has a proven record of superior performance in packed towers of all sizes, IMPAC is considerably more efficient in towers of four feet or more in diameter.

Available in two sizes (2.3" and 3.5"), LANPAC is widely recognized throughout the United States as "the ultimate tower packing" by engineers in the air pollution, drinking water treatment, and chemical processing industries.

LANPAC's unique, patented geometry makes it measurably more efficient in both mass transfer capabilities and energy consumption rates. As a result, use of LANPAC reduces both the capital and operating costs for a packed column by as much as 60%!

Compared to other tower packings, LANPAC offers many unique features and benefits, including:

- Extremely large and effective surface area (45 sq. ft./cu. ft. for the 3.5" LANPAC, and 68 sq. ft./cu. ft. for the 2.3" unit).
- Near perfect geometric symmetry.
- Up to 50,000 liquid dripping points per cu. ft.
- Non-nesting, non-interlocking.
- Full field proven non-plugging capability.
- High surface accessibility.
- Enhanced surface wetability.

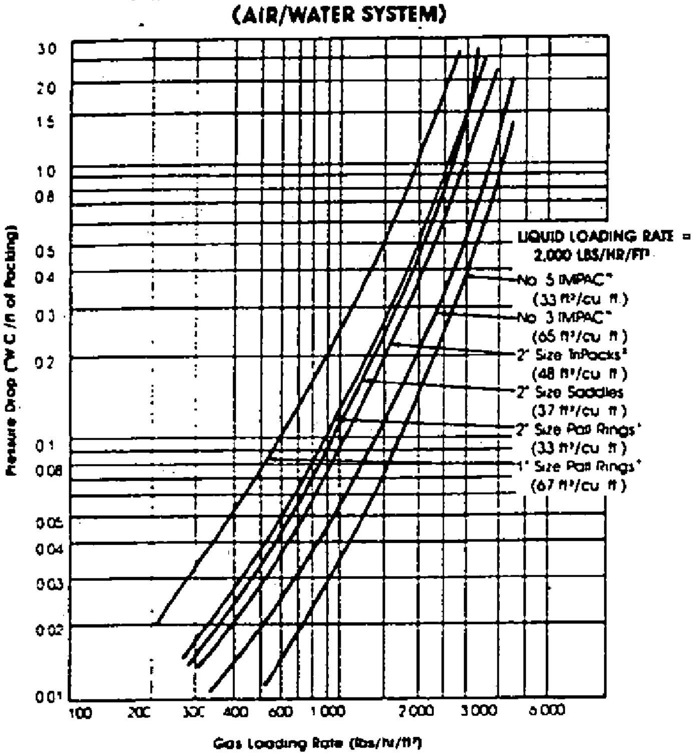
LANPAC's open and non-obstructive structure gives it the ability to disperse and distribute fluid flows evenly in both longitudinal and lateral directions. Consequently, LANPAC outperforms other tower packings smaller in size. For example, the 3.5" LANPAC is from 10% to 50% more efficient than competitive 2" packings (see chart with comparative test data at left).

LANPAC is available in a variety of plastic materials including polypropylene, polyethylene, PVDF, Halar, Tefzel, PVC, CPVC, Teflon, etc.

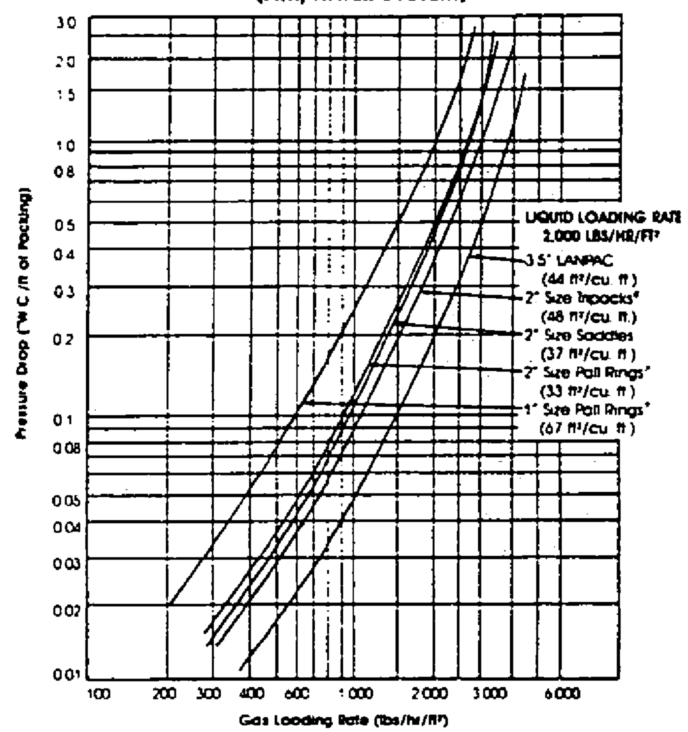
CONTACT LANTEC FOR TEST DATA AND DETAILED SPECIFICATIONS.

** U.S. Patent #4,668,442; Canada #1,245,975; worldwide patents pending*

PRESSURE DROP COMPARISON BETWEEN IMPAC AND OTHER PLASTIC PACKINGS (AIR/WATER SYSTEM)



PRESSURE DROP COMPARISON BETWEEN 3.5" LANPAC AND OTHER PLASTIC PACKINGS (AIR/WATER SYSTEM)



PHYSICAL CHARACTERISTICS

	No. 3 IMPAC™	No. 5 IMPAC™
Nominal Size	3.3"	5.5"
Void Fraction	91.4%	95%
Weight (lbs/cu. ft.) (Polypropylene)	5.2	3.0
Geometric Surface Area (ft²/cu. ft.)	65	33
No. of Pieces/cu. ft.	58	7.2
Packing Factor (1/ft.)	15	6

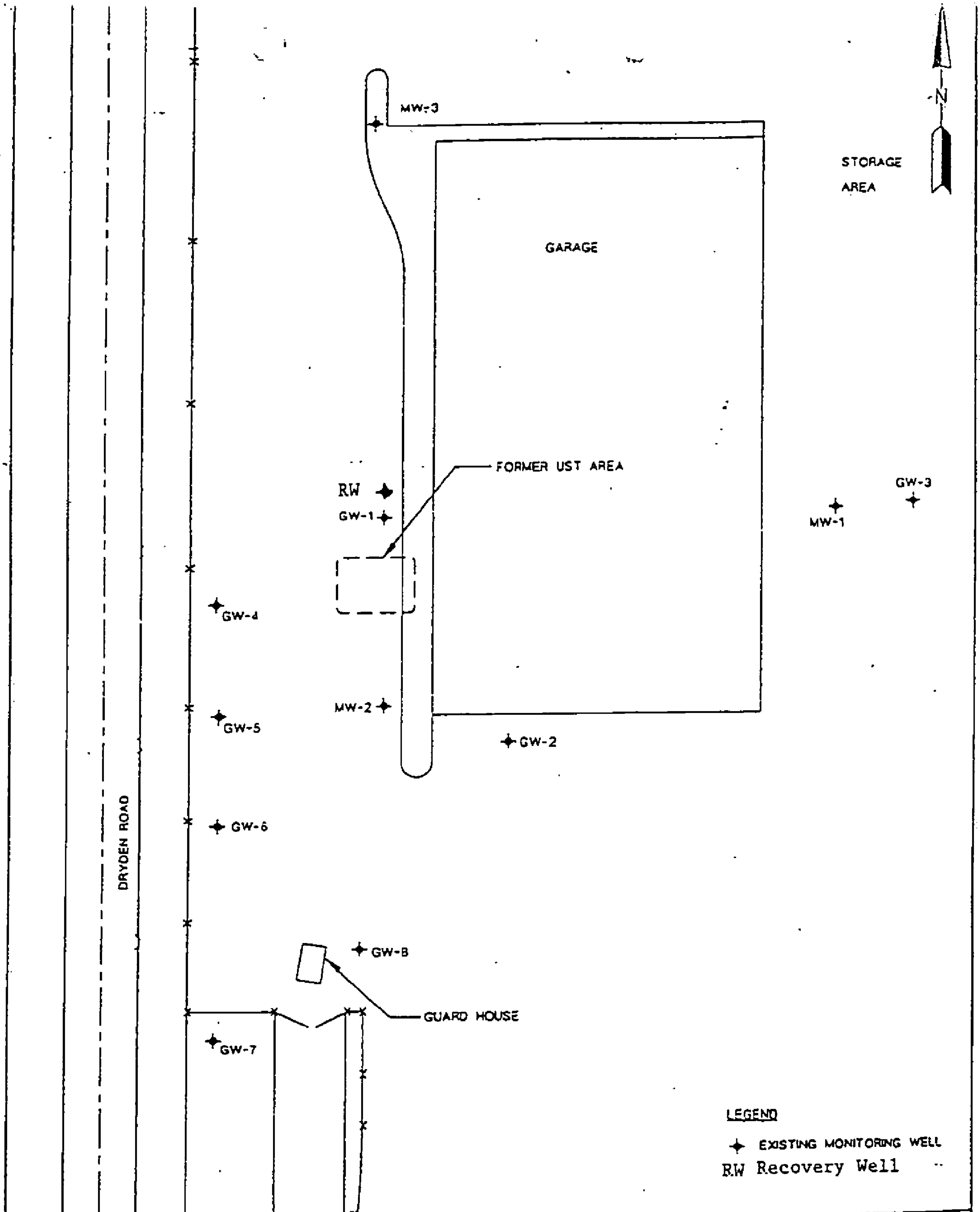
PHYSICAL CHARACTERISTICS

	3.5" LANPAC®	2.3" LANPAC®
Nominal Size	3.5"	2.3"
Void Fraction	92.5%	89%
Weight (lbs/cu. ft.) (Polypropylene)	4.2	6.2
Geometric Surface Area (ft²/cu. ft.)	45	68
No. of Pieces/cu. ft.	50	200
Packing Factor (1/ft.)	14	21

LANTEC PRODUCTS, INC.

Delivering Tomorrow's Packing Technology Today!

5308 Derry Ave., Unit E, Agoura Hills, CA 91301 • PHONE: (818) 707-2285 • FAX: (818) 707-9367



SCS ENGINEERS

STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
2060 READING ROAD SUITE 200 CINCINNATI, OHIO 45202
PH. (513) 421-5353 FAX NO. (513) 421-2847

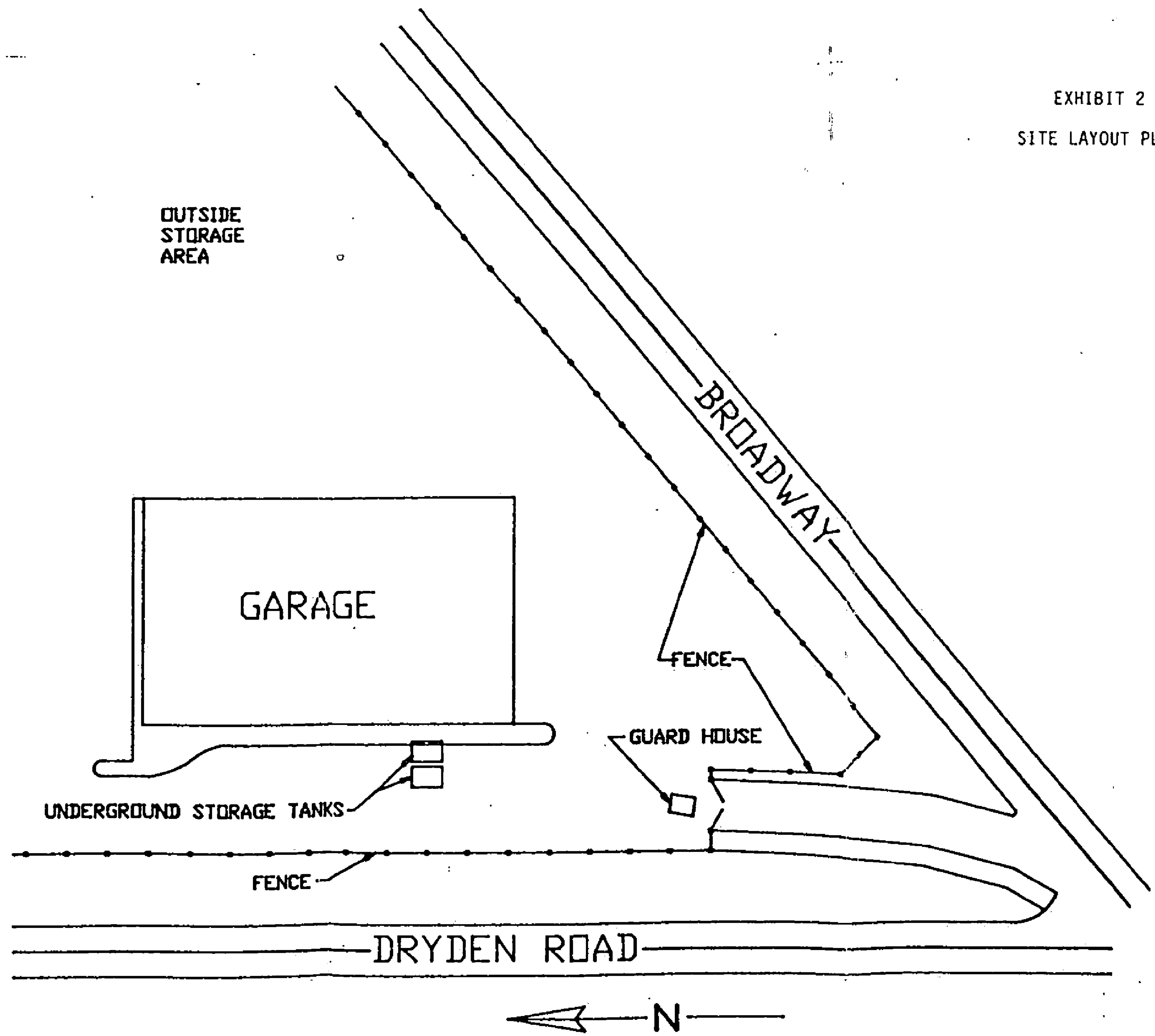
PROJ. NO.	CADD FILE:	DATE:	SCALE:
0590005.03	DPL	DECEMBER 1994	NOT TO SCALE

FIGURE 2

DAYTON POWER & LIGHT COMPANY
DAYTON, OHIO

EXHIBIT 2

SITE LAYOUT PLAN



PREPARED FOR: DAYTON POWER AND LIGHT
DAYTON, OHIO

PROJECT NAME: 1900 DRYDEN ROAD

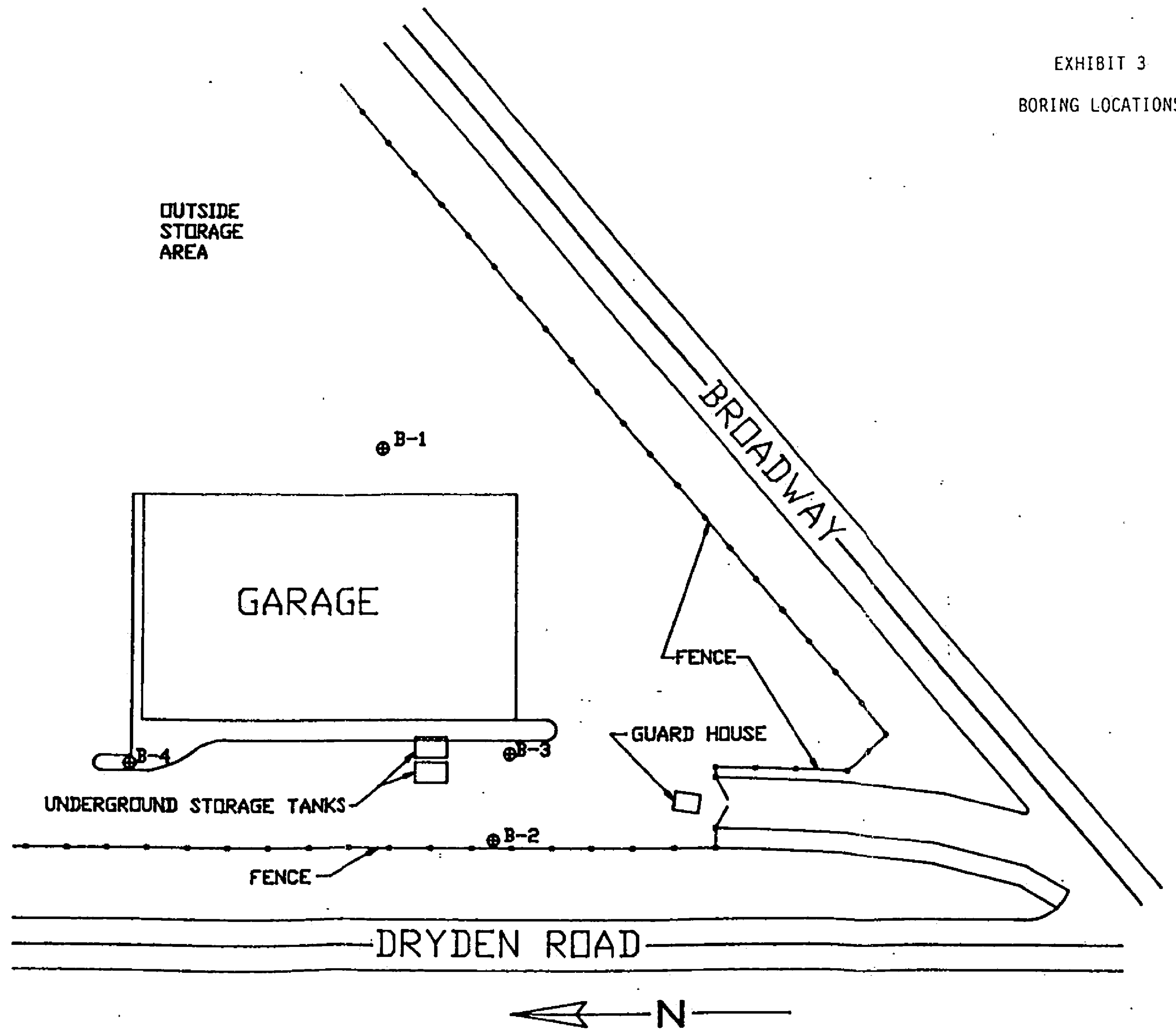
PREPARED BY: SCS ENGINEERS
COVINGTON, KENTUCY

SCALE: 1 INCH = 60 FEET

DATE: JULY 1990

EXHIBIT 3

BORING LOCATIONS



PREPARED FOR: DAYTON POWER AND LIGHT
DAYTON, OHIO

PROJECT NAME: 1900 DRYDEN ROAD

PREPARED BY: SCS ENGINEERS
COVINGTON, KENTUCKY

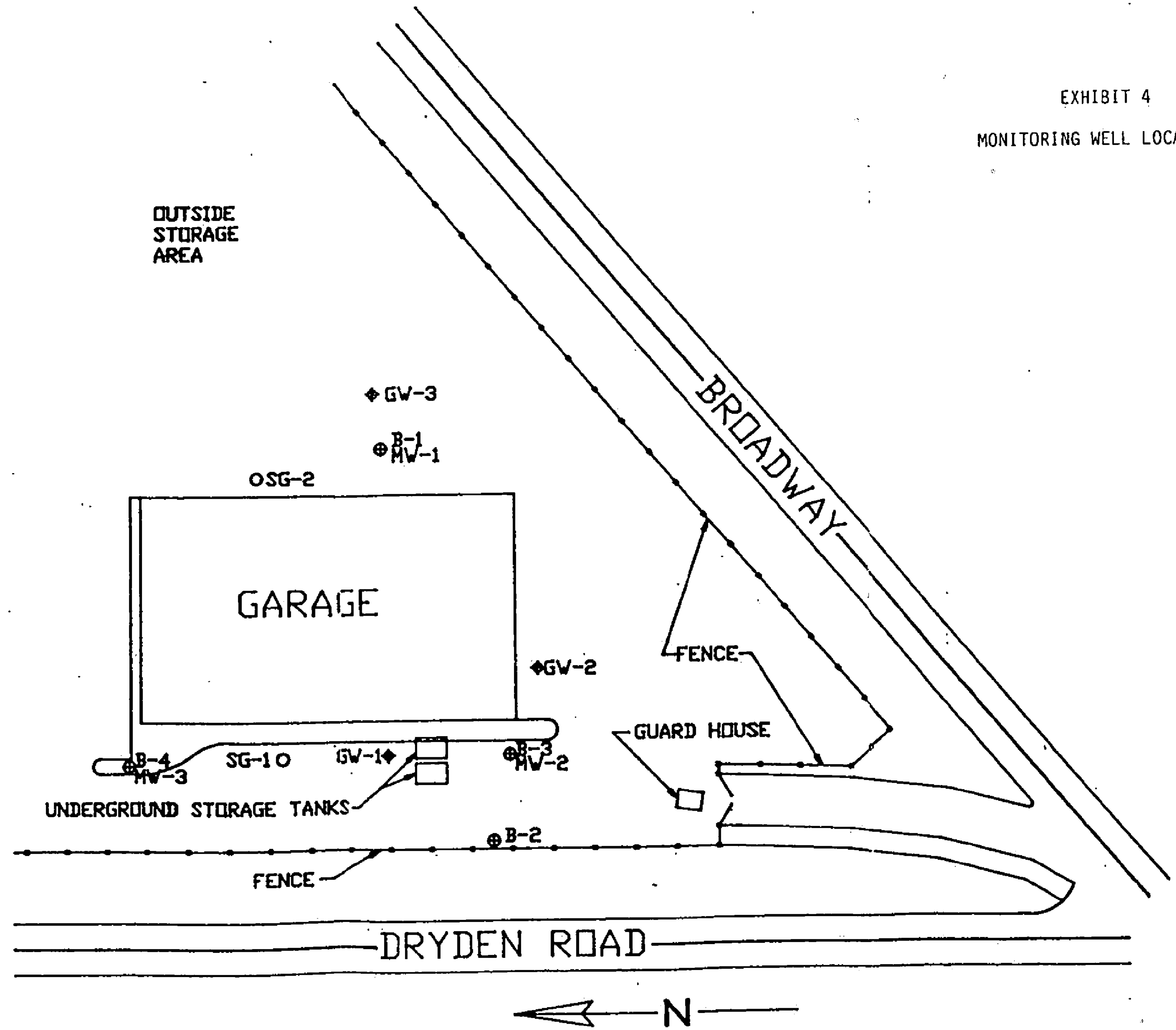
SCALE: 1 INCH = 60 FEET

DATE: JULY 1990

7

EXHIBIT 4

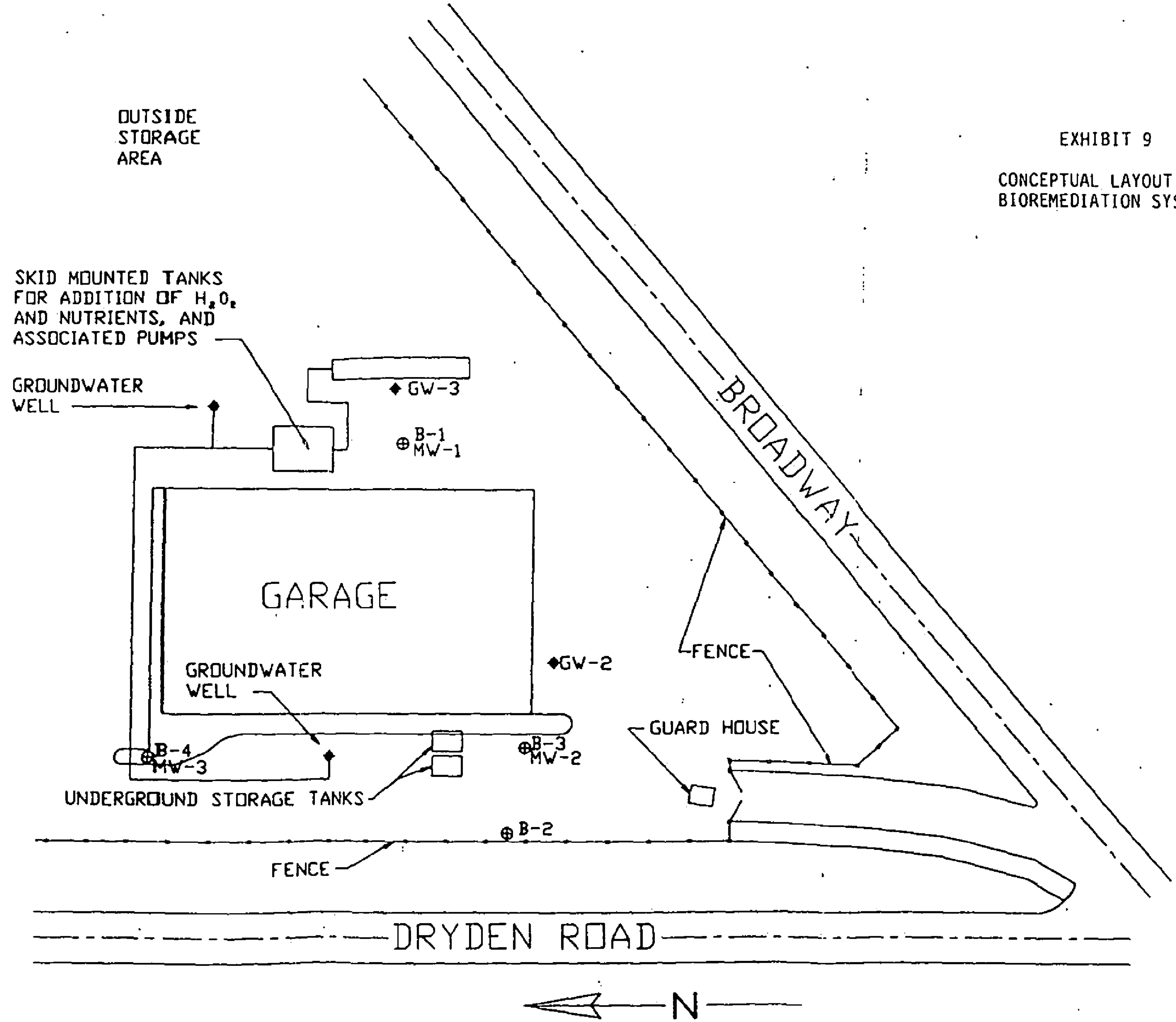
MONITORING WELL LOCATIONS



PREPARED FOR: DAYTON POWER AND LIGHT DAYTON, OHIO	
PROJECT NAME: 1900 DRYDEN ROAD	
PREPARED BY: SCS ENGINEERS COVINGTON, KENTUCY	
SCALE: 1 INCH = 60 FEET	
DATE: JULY 1990	

EXHIBIT 9

CONCEPTUAL LAYOUT OF BIOREMEDIATION SYSTEM



PREPARED FOR: DAYTON POWER AND LIGHT
DAYTON, OHIO

PROJECT NAME: 1900 DRYDEN ROAD

PREPARED BY: SCS ENGINEERS
COVINGTON, KENTUCY

SCALE: 1 INCH = 60 FEET

DATE: JULY 1990

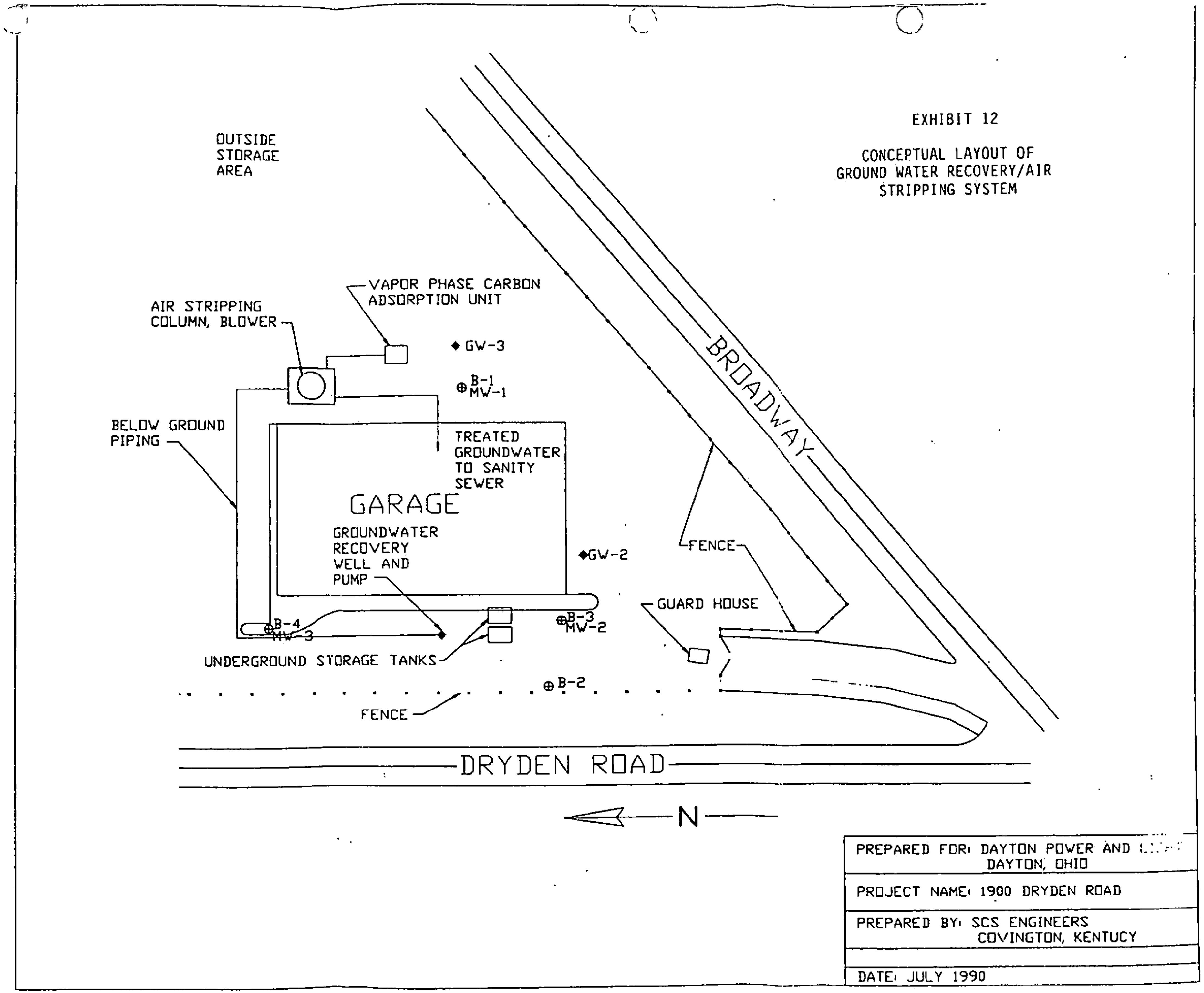


EXHIBIT 12
CONCEPTUAL LAYOUT OF GROUND WATER RECOVERY/AIR STRIPPING SYSTEM
OUTSIDE STORAGE AREA
VAPOR PHASE CARBON ADSORPTION UNIT
AIR STRIPPING COLUMN, BLOWER
GW-3
B-1 MW-1
BELOW GROUND PIPING
TREATED GROUNDWATER TO SANITY SEWER
GARAGE
GROUNDWATER RECOVERY WELL AND PUMP
GW-2
B-4 MW-3
B-3 MW-2
UNDERGROUND STORAGE TANKS
GUARD HOUSE
FENCE
B-2
FENCE
BROADWAY
DRYDEN ROAD
N
PREPARED FOR: DAYTON POWER AND
DAYTON, OHIO
PROJECT NAME: 1900 DRYDEN ROAD
PREPARED BY: SCS ENGINEERS
COVINGTON, KENTUCKY
DATE: JULY 1990

APPENDIX E

Sample Remedial Action Status Report

LJB
inc

Incident No. 579286-00

Remedial Action Status Report
DP&L Transportation Center
1900 Dryden Road, Dayton, Ohio

I. System Status

Comments
No changes were made in the standard sampling methodology (attached) this reporting period.

II. Groundwater Information

Table 1 Groundwater Elevations (USGS Datum)

Date	GW-7	GW-8	MW-1	GW-3	MW-3	GW-2

Table 2 Groundwater Parameters-Analytical Laboratory Results

(Sample Date)	MW-2	GW-4	GW-5	GW-6	GW-1
pH (s.u.)					
Benzene (μg/l)					
Toluene (μg/l)					
Ethylbenzene (μg/l)					
Total Xylenes (μg/l)					
*Plate Counts (cfu's) (as HC/Total cfu's)					

CFU's: denotes Colony Forming Units
*The Plate Count Number listed in the table above is the measured Hydrocarbon Degrader CFU's as related to the bacterial CFU's.